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Hawaiian Volcano Observatory Summary 96; Part I, Seismic Data, January to December 1996

by Jennifer S. Nakata

Chronological Summary
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**U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY**

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TABLE OF CONTENTS

	Page
Hawaiian Volcano Observatory Staff	1
Introduction	2
Chronological Summary	3
Table C-1 1996 Eruption statistics.....	4
Figure C-1 Eruption flow map	5
Figure C-2a Plot of Kilauea data	6
Figure C-2b Plot of Mauna Loa data.....	7
Seismic Instrumentation	8
Figure 1 Map of Hawai`i Island showing geographic and geologic features	9
Figure 2 Seismic stations operated by the USGS on Hawai`i Island	10
Figure 3 Seismic network telemetry scheme	11
Figure 4a Seismic network telemetry scheme at Kilauea summit.....	12
Figure 4b Broad-band telemetry scheme at Kilauea summit.....	12
Table 1 Seismic stations in Hawai`i operated by the USGS	13
Table 2 Seismic instrument types in use by HVO	15
Figure 5 HVO system response curve of the four basic seismograph types	16
Seismic Data Processing	17
Seismic Catalog	18
Table 3 Number of earthquakes and minutes of tremor recorded on seismographs around Kilauea and Mauna Loa	19
Table 4 Coordinates of named regions used for classifying earthquakes	26
Figure 6 Earthquake classification, shallow for Kilauea and Mauna Loa	28
Figure 7 Earthquake classification, intermediate for Kilauea and Mauna Loa	29
Figure 8 Earthquake classification, crustal, for Hawai`i Island	30
Figure 9 Earthquake classification, deep, for Hawai`i Island	31
Figure 10 Earthquake locations, Hawaiian Islands, all depths, $M \geq 3.5$	32
Figure 11 Earthquake locations, Hawai`i Island, all depths, $M \geq 3.0$	33
Figure 12 Earthquake locations, Hawai`i Island, shallow, $M \geq 2.0$	34
Figure 13 Earthquake locations, Hawai`i Island, intermediate, $M \geq 2.0$	35
Figure 14 Earthquake locations, Hawai`i Island, deep, $M \geq 2.0$	36
Figure 15 Earthquake locations, Kilauea summit, shallow, $M \geq 1.0$	37
Figure 16 Earthquake locations, Kilauea summit, intermediate, $M \geq 1.0$	38
Figure 17 Earthquake locations, Kilauea summit, deep, $M \geq 1.0$	39
Figure 18 Earthquake locations, Kilauea south flank, shallow, $M \geq 2.0$	40
Figure 19 Earthquake locations, Kilauea south flank, intermediate, $M \geq 2.0$	41
Figure 20 Earthquake locations, Kilauea south flank, deep, $M \geq 2.0$	42
Figure 21 Earthquake locations, Mauna Loa summit, shallow, $M \geq 2.0$	43
Figure 22 Earthquake locations, Mauna Loa summit, intermediate, $M \geq 2.0$	44
Figure 23 Earthquake locations, Mauna Loa summit, deep, $M \geq 2.0$	45
Table 5 List of all located earthquakes	46
Table 6 List of located earthquakes of magnitude 3.0 or greater	78

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INTRODUCTION

The Hawaiian Volcano Observatory (HVO) summary presents seismic data gathered during the year and a chronological narrative describing the volcanic events. The seismic summary is offered without interpretation as a source of preliminary data. It is complete in the sense that all data for events of $M \geq 1.5$ routinely gathered by the Observatory are included. The emphasis in collection of tilt and deformation data has shifted from quarterly measurements at a few water-tube tilt stations ("wet" tilt) to a larger number of continuously recording borehole tiltmeters, repeated measurements at numerous spirit-level tilt stations ("dry" tilt), and surveying of level and trilateration networks. Because of the large quantity of deformation data now gathered and differing schedules of data reduction, the seismic and deformation summaries are published separately.

The HVO summaries have been published in various forms since 1956. Summaries prior to 1974 were issued quarterly, but cost, convenience of preparation and distribution, and the large quantities of data dictated an annual publication beginning with Summary 74 for the year 1974. Summary 86 (the introduction of CUSP at HVO) includes a description of the seismic instrumentation, calibration, and processing used in recent years. The present summary includes enough background information on the seismic network and processing to allow use of the data and to provide an understanding of how they were gathered.

A report tabulating instrumentation, calibration, and recording history of each seismic station in the network by Klein and Koyanagi is available as a USGS Open-File Report¹. It is designed as a reference for users of seismograms and phase data and includes and augments the information in the station table in this summary.

¹ Klein, F.W., and Koyanagi, R.Y., 1980, Hawaiian Volcano Observatory seismic network history, 1950-1979: U.S. Geological Survey Open-File Report 80-302, 84 p.

CHRONOLOGICAL SUMMARY 1996

by

C. Heliker, C. Thornber, and D. Sherrod

Episode 53 of Kilauea's ongoing Pu'u 'O'o - Kupaianaha eruption continued this year. Flows from the 51 vent resurfaced most of the eastern side of the Kamoamoa flow field below the 1,600-ft elevation (fig. C-1). Early in the year, breakouts near the coast encroached on the Kupaianaha flow field, while, farther upslope, the gap between the two flow fields was narrowed on February 1, when a flow from the 2,450-ft skylight cut a swath through the forest. For the rest of the year, most surface flows were confined to the existing flow field. The tube leading from the episode 51 vent to the 2,250-ft elevation has survived for four years. The February 1 breakouts were the first surface flows above that elevation since the beginning of episode 53 in February 1993.

The February 1st event, during which a seismic swarm and rapid inflation at the summit were followed by deflation and a surge in supply at the eruption site, may have been a harbinger of other changes. After the 10-day pause that followed this event, the eruption seemed to return to normal, but soon there were indications that the system was perturbed. On March 24, we had a summit event that resembled a mini-version of the February 1 activity. The summit inflated 4.3 microradians in one hour, then began to deflate. Two hours later, a series of breakouts began at the eruption site. A similar, but even smaller, event took place on May 11.

The lava chemistry also changed following February 1, with an upturn in MgO content, followed by a trend suggesting mixing with a cooler component from the summit reservoir. Overall, MgO declined slightly during the year (fig.C-2a).

Lava entered the ocean at several sites in 1996, with first the Kamokuna entry, then Lae'apuki, predominating. The amount of new land created by the Kamokuna entry was relatively small, and, because of the bench collapses at Lae'apuki, there was a net loss of land at that entry.

There were four approximately evenly spaced eruptive pauses in 1996, bringing the total to 15 since the beginning of episode 53. The last two pauses of the year were both brief (~24 hrs) and resulted in little surface-flow activity.

The Pu'u 'O'o lava pond remained at a relatively constant level, between 75 and 90 m below the low point on the crater rim, most of the year. The pond rose to ~55 m below the rim briefly on February 1, resurfacing the entire crater floor with fresh pahoehoe. By mid-April, the crater floor had settled into a new configuration, with two ponds separated by an isthmus of crust 30 m wide. In May, during pause 13, both ponds rose about 15 m and submerged the isthmus to become a single pond. For several days, this scenario alternated with periods when the level dropped and two ponds were present at different levels. As one pond rose, it overflowed the isthmus and poured into the other.

After the pause, the isthmus was an island in a single pond for awhile, then, as the level gradually dropped, the island became a peninsula. In the summer, the pond was once again divided in two. In general, the uplift pond was less active and sometimes was reduced to a glowing hole in thick crust. At the year's end, there were two ponds.

Table C-1 presents the summary facts about the continuing eruption. Figures C-2a and C-2b summarize seismic and other data relative to time for Kilauea and Mauna Loa.

Table C-1. ERUPTION STATISTICS

Areas

Total area covered by lava, 3/83-12/96: **96.6 sq km** (37.3 sq mi)

Pu'u 'O'o flows (episodes 1-47 and the "A vent" flow of episode 48):

25 sq km* (9.7 sq mi)

*Pu'u 'O'o flows originally covered about 42 sq km, but much of this area was reburied by flows of subsequent episodes.

Kupaianaha flows (episode 48): **41 sq km** (16 sq mi)

Episode 49 flows: **4 sq km** (1.5 sq mi)

Episodes 50-53 flows: **26.6 sq km** (9.5 sq mi)

Total new land created, 12/86-12/96: 222 hectares (550 acres) *

Kamoamoa delta (11/92-12/96): 93 hectares (230 acres)

*These are net figures, which do not include new land that was claimed by wave erosion or collapse of the active lava bench.

Volumes

Total, 1/83-12/96 Approximately: $1450 \times 10^6 \text{ m}^3$ (dense rock equivalent)

Episodes 1-47 (1/83 - 6/86) $385 \times 10^6 \text{ m}^3$

Episode 48 (7/86 - 2/92) $500 \times 10^6 \text{ m}^3$

Episode 49 (11/91) $11 \times 10^6 \text{ m}^3$

Episode 50 (2/92 - 3/92) $3 \times 10^6 \text{ m}^3$

Episode 51 (3/92 - 2/93) $32 \times 10^6 \text{ m}^3$

Episode 52 (10/92) $2 \times 10^6 \text{ m}^3$

Episode 53 (2/93 - 12/96) $525 \times 10^6 \text{ m}^3$

Other fascinating facts

Height of Pu'u 'O'o cone, 1/97: **232 m**. The cone has lost 25 m due to collapse since 1986.

Dimensions of Pu'u 'O'o Crater: ~**240 m x 360 m**

Depth of Pu'u 'O'o Crater floor, 12/96: **55-60 m**

Height of episode 50-53 lava shield: ~**60 m**

Height of Kupaianaha lava shield: **56 m**

Kupaianaha vent active 7/86 - 2/92

Thickness of lava at the coast:

~**25 m** over Highway 130 at Queens Bath

~**15-25 m** over Kalapana Gardens

Highway covered by lava flows from this eruption: **13 km**

Structures destroyed

Residences destroyed through 10/91 (none since then): **181**

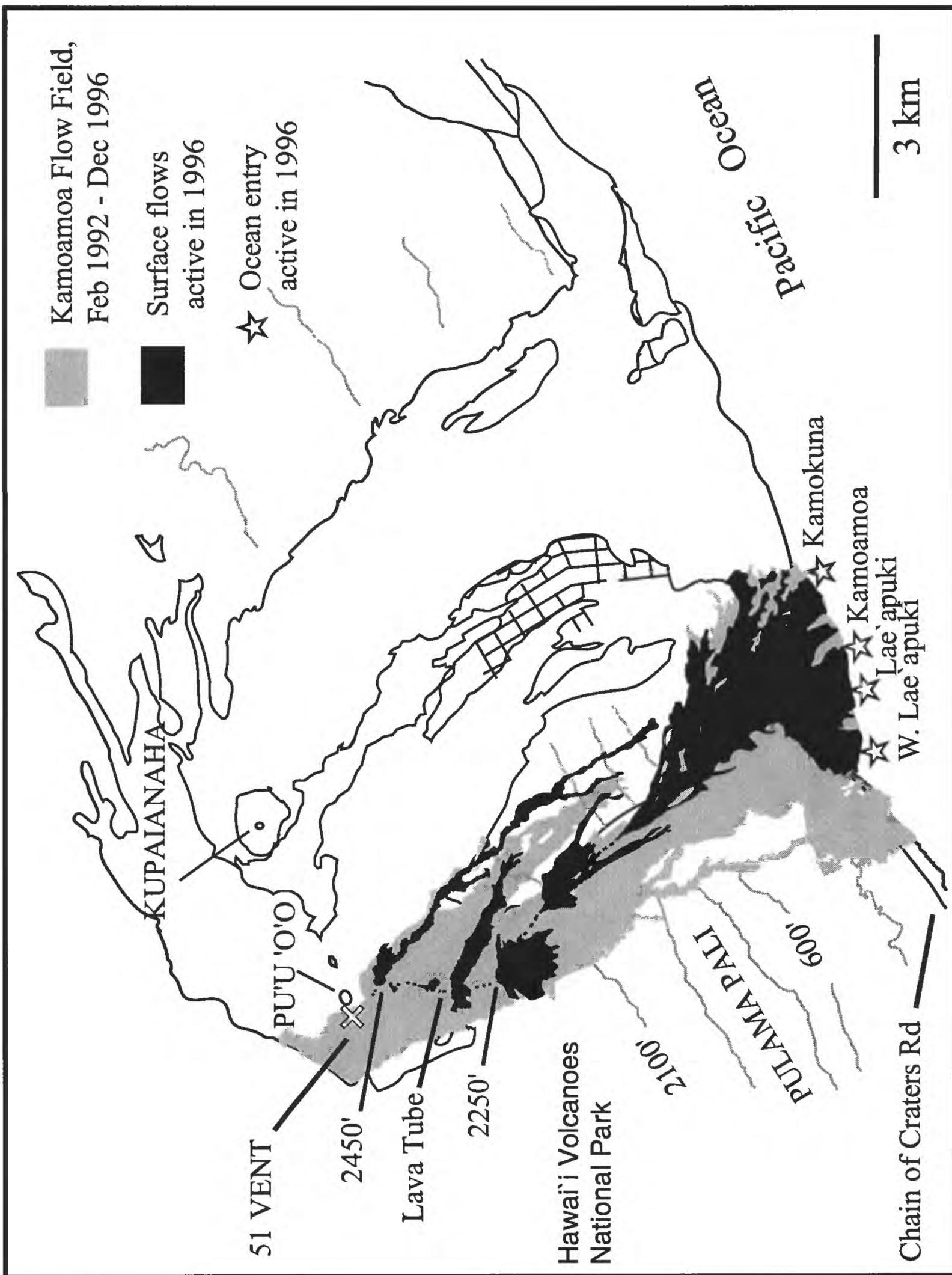


Figure C-1. Lava flows produced from 1983 through 1996.

KILAUEA

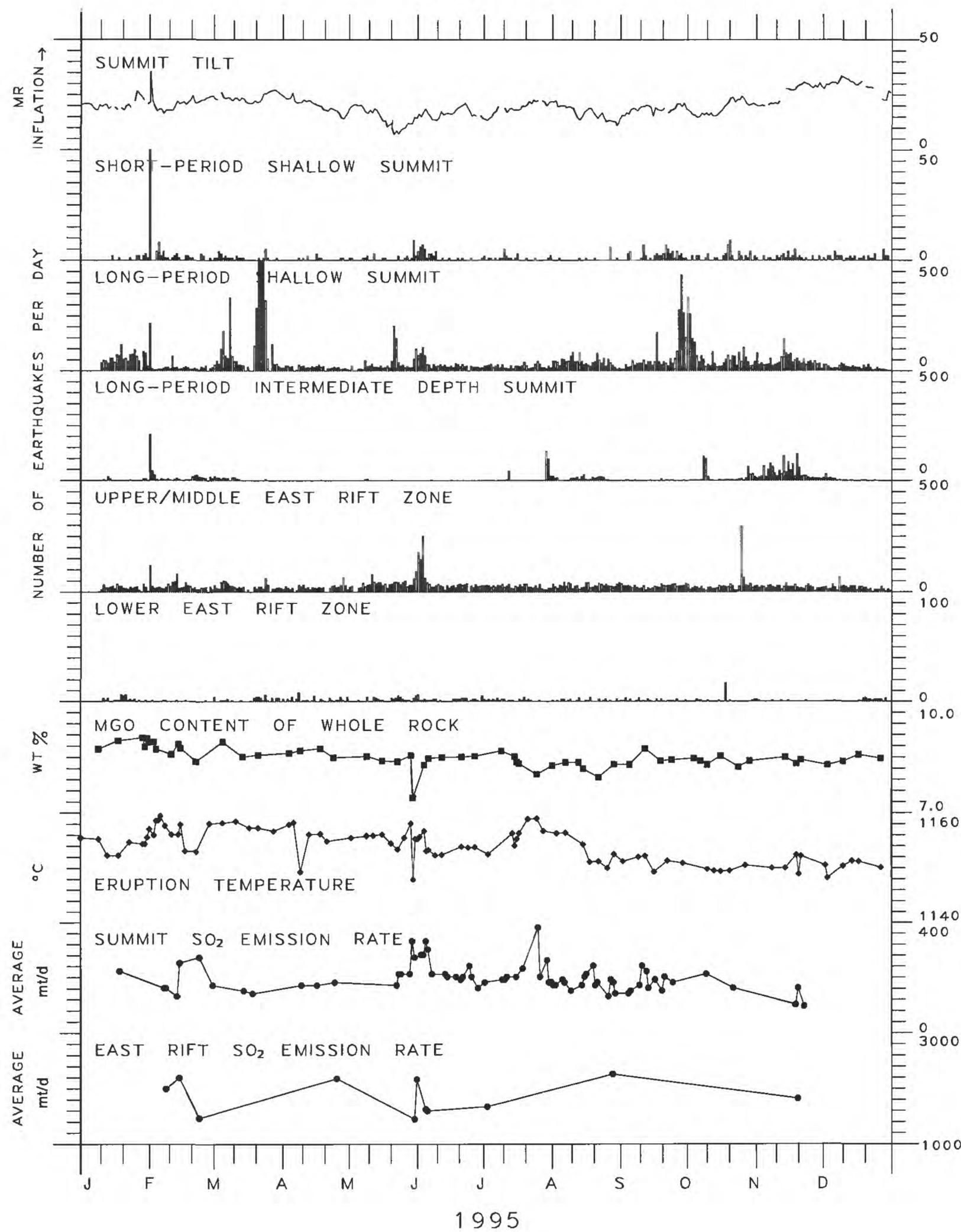


Figure C-2a. Selected seismic, geodetic, petrologic and geochemical data for Kilauea, 1996.

MAUNA LOA

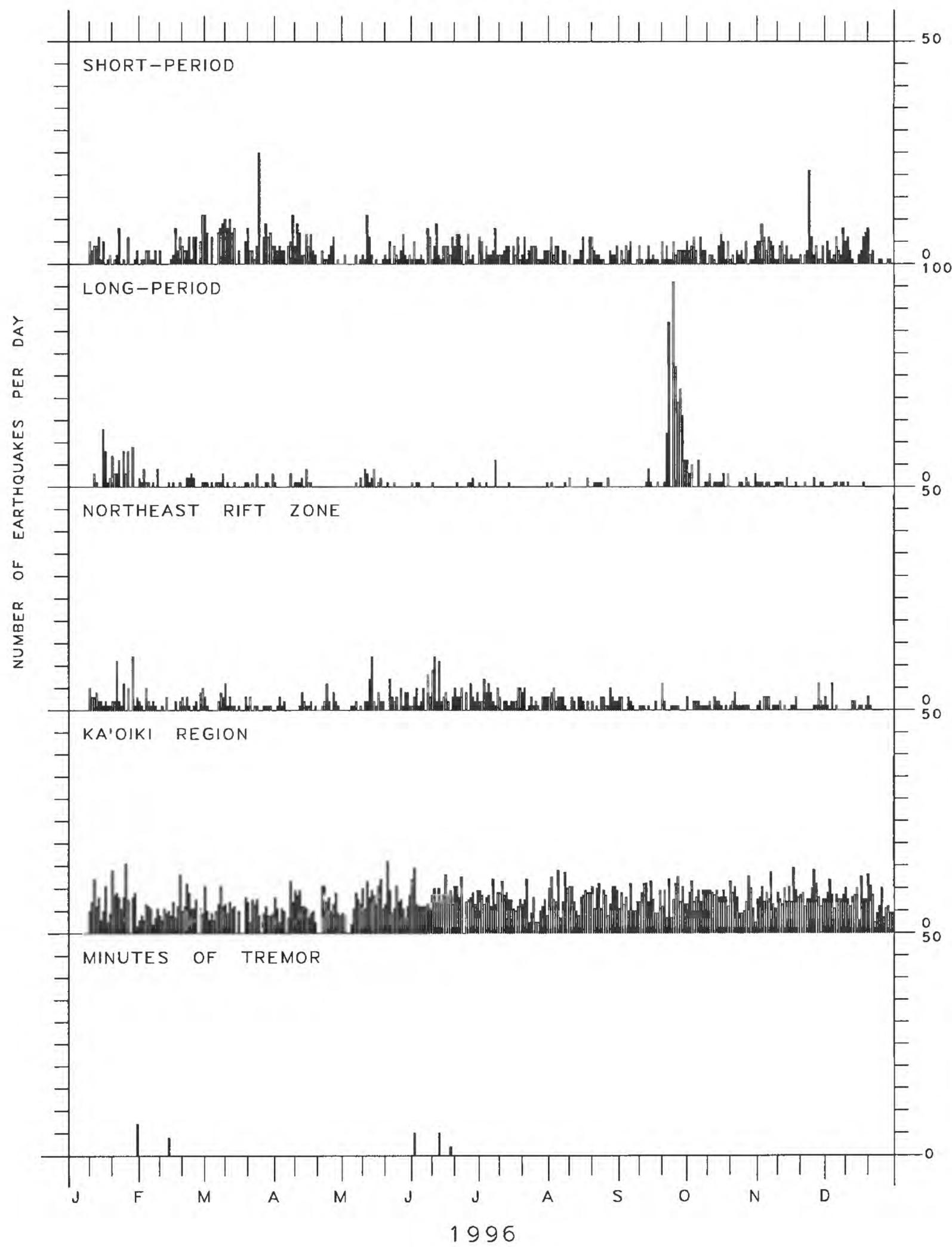


Figure C-2b. Selected seismic data for Mauna Loa, 1996.

SEISMIC INSTRUMENTATION

The network. The Hawaiian Volcano Observatory maintains an extensive telemetered seismic network on the Island of Hawai'i. The 1996 network consisted of 51 station sites: 12 three-component, 1 seven-component (which included a low-gain vertical with a unity gain setting, and a three-component Kinematic Force-Balance accelerometer), 1 four-component and 2 two-component (each site included a moderate-gain vertical with a 48db setting), and 35 vertical-component-only sites. The coverage is most dense on and around Kilauea Volcano. All seismic signals from the short-period network are telemetered to the Observatory for recording.

Figure 1 is a map of selected geographic and geologic features. Figure 2 shows the seismic stations operated on the Island of Hawai'i during 1996. Figure 3 indicates the telemetry scheme for the seismic stations, and Figures 4a and 4b are expanded telemetry schemes at Kilauea summit: 4a, HVO seismic stations and 4b, broadband network installed by Menlo Park and maintained by HVO.

Table 1 lists seismic stations by names, four-letter station codes, coordinates in degrees and minutes, elevation in meters, and other data, as described below, pertaining to each station. The list includes all the stations operated by the U.S. Geological Survey in Hawai'i during 1996. A few seismic stations operated by the Pacific Tsunami Warning Center (NOAA) on the Islands of Hawai'i, O'ahu and Maui are also listed. Phase times from these stations are used to supplement local earthquakes and earthquakes that occur within the Hawaiian Archipelago but distant from the Hawai'i Island network.

Instrumentation and recording. Each telemetered station has a voltage-controlled oscillator (VCO) for FM multiplex transmission to HVO via radio. These telemetering stations are all of Type 1, Earthquake Hazards Team (EHT) standard system used in USGS seismic networks (see Table 2 for details). After discrimination at the receiver, the analog signals are converted to digital form as part of the routine computer-location processing and archiving. Continuous signals from the telemetered network are saved on 4-mm digital-audio tape (DAT) recording units. Three DAT recorders run in automatic rotation, as each 30-hr tape is filled. Analog signals from 18 selected stations are recorded on one Develocorder ('A') using 16-mm microfilm. Optic recordings are coded in Table 1 as follows: D - Develocorder film, H - Helicorder paper, and I - ink paper. The paper records, as well as the 16-mm Develocorder microfilms, are archived at HVO.

Seismograph response and calibration. Displacement response curve for the short-period seismograph type in use is given in Figure 5. The Type 1 curve gives the displacement magnification of the standard EHT system from ground motion at the seismometer to the seismic trace, as seen on a 20x Develocorder film viewer. The curve plots the unit response, which is multiplied by a constant but known factor, CAL, to get the response for an individual station. Individual CAL factors for Type 1 seismographs are Develocorder-equivalent, peak-to-peak amplitudes, measured in millimeters, of a 100-microvolt 5 to 8-Hz signal introduced to the preamp/VCO in place of the geophone at the field station. The calibration process is normally performed each time a station is visited for other required maintenance.

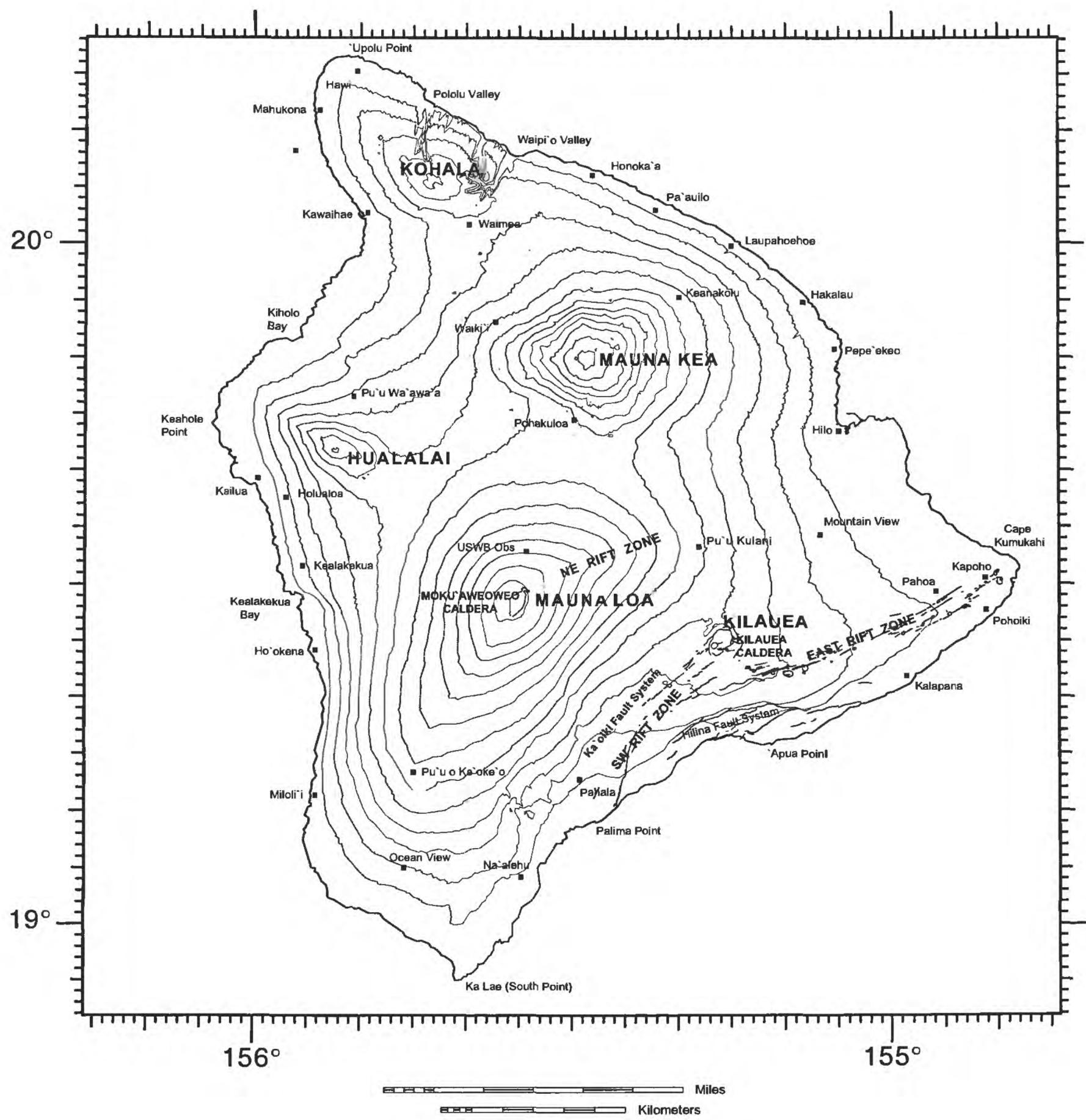


Figure 1. Map of the Island of Hawai'i, showing principal settlements and selected geographic and geologic features.

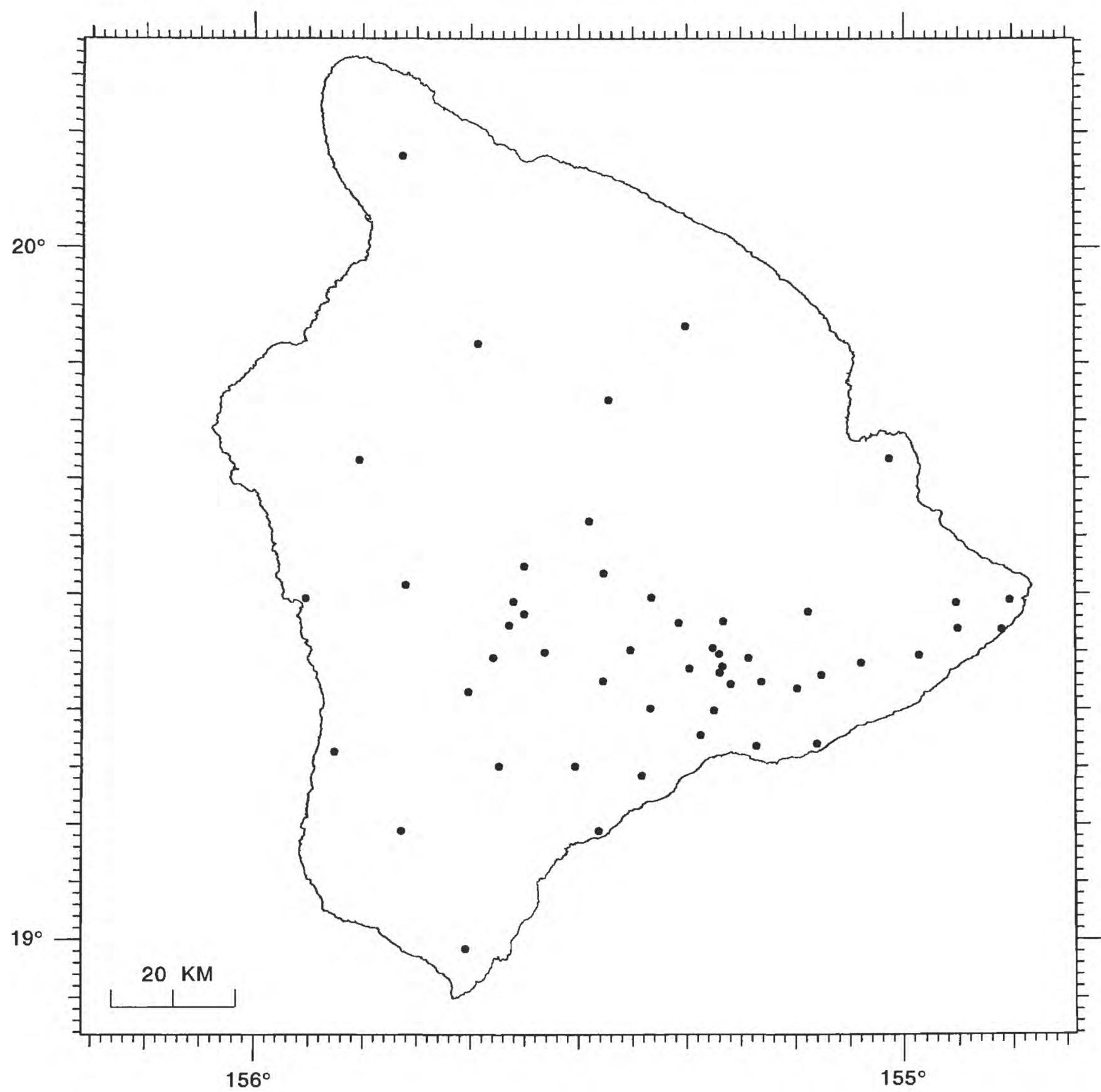
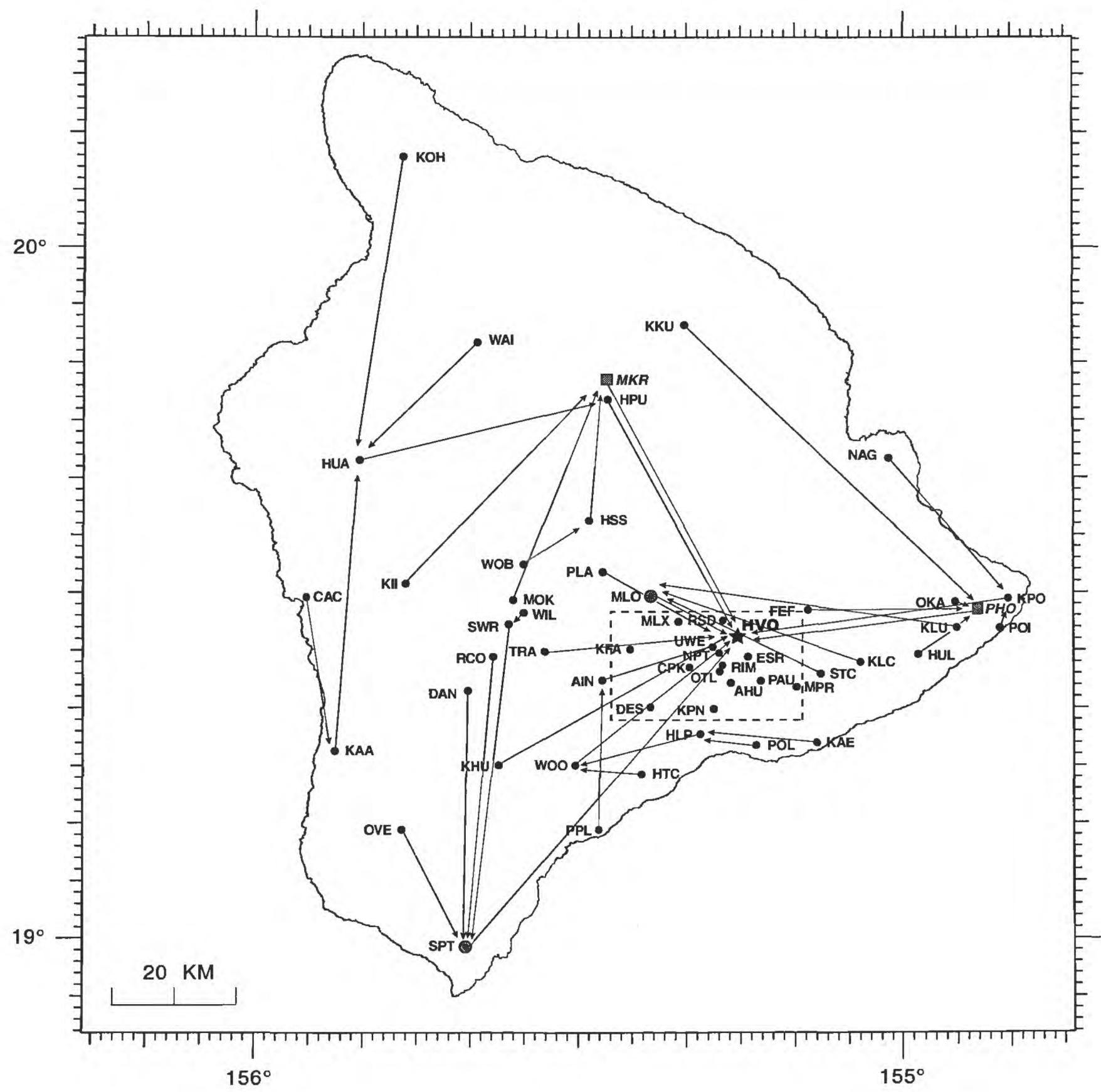
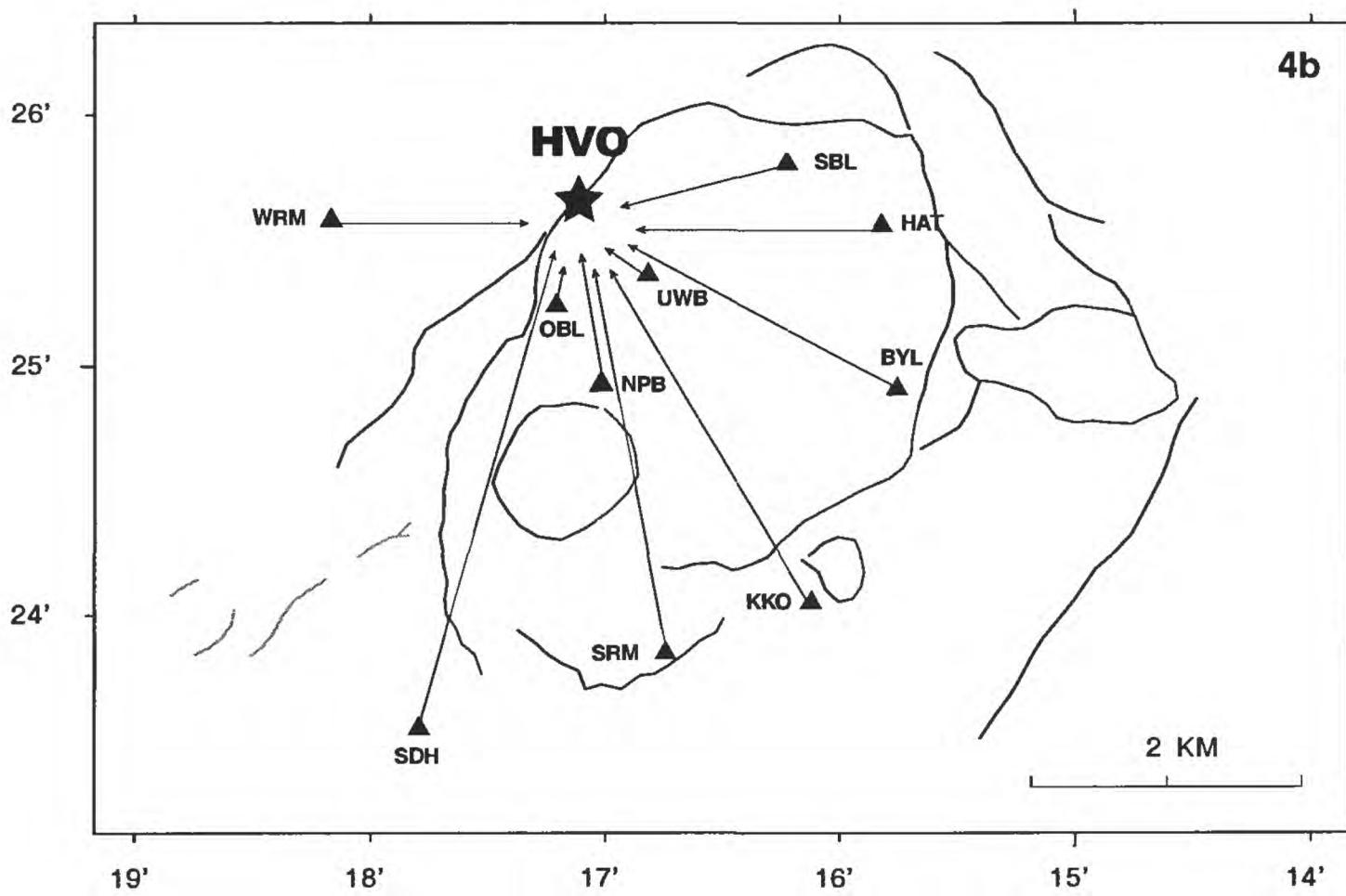
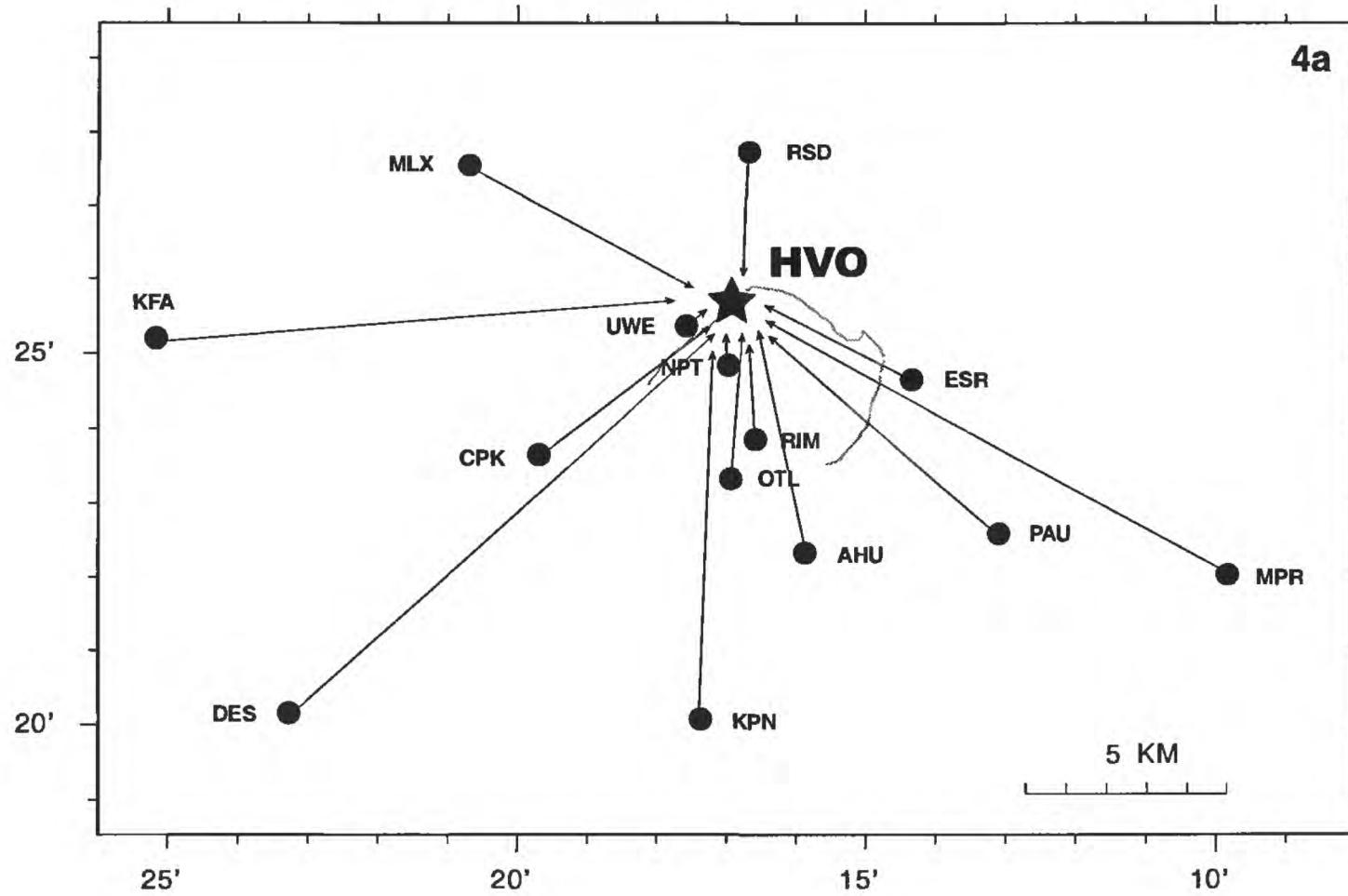


Figure 2. Seismic stations operational during 1996 on the Island of Hawai'i.



- ★ Hawaiian Volcano Observatory
- Network station sites
- Direct-to-Line 32 Channel
- Repeater sites
- [] Kilauea summit

Figure 3. Telemetry scheme for the 1996 Hawaiian Volcano Observatory seismic network.



- ★ Hawaiian Volcano Observatory
- Network sites
- ▲ Broadband sites

Figure 4a. Expanded telemetry scheme for the 1996 Hawaiian Volcano Observatory seismic network at Kilauea summit.

Figure 4b. Expanded telemetry scheme for the 1996 Menlo Park broadband network at Kilauea summit.

Table 1. Seismic stations in Hawai'i operated by the USGS in 1996.

STATION NAME	CODE	-LAT-		-LON-		ELEV (M)	DELAY 1	DELAY 2	CAL	SEIS	OPTIC	TYPE	RECORD
		D	M	D	M								
AHUA	AHUV	19	22.40	155	15.90	1070	-0.10	-0.13	3.1	E5		DI	
AHUA	AHUE	19	22.40	155	15.90	1070	-0.10	-0.13	3.0	E5	MW		
AHUA	AHUN	19	22.40	155	15.90	1070	-0.10	-0.13	3.0	E5	MW		
AINAPO	AINV	19	22.50	155	27.62	1524	0.13	0.17	6.8	L5			
AINAPO	AINE	19	22.50	155	27.62	1524	0.13	0.17	3.0	L5	MW		
AINAPO	AINN	19	22.50	155	27.62	1524	0.13	0.17	3.0	L5	MW		
AINAPO	AINZ	19	22.50	155	27.62	1524	0.13	0.17	0.0	L5		D	
CAPTAIN COOK	CACV	19	29.29	155	55.09	323	0.00	-0.16	1.1	L5			
CONE PEAK	CPKV	19	23.70	155	19.70	1038	-0.26	-0.07	6.0	L5			
DANDELION	DANV	19	21.42	155	40.04	3003	-0.27	0.03	4.3	E5			
DESERT	DESV	19	20.20	155	23.30	815	-0.29	-0.13	4.5	L5		DI	
DIAMOND HEAD, OA	DHHZ	21	16.12	157	48.25	137	0.00	0.00	0.0	S13			
ESCAPE ROAD	ESRV	19	24.68	155	14.33	1177	-0.17	-0.19	1.2	L5		D	
FERN FOREST	FEFV	19	28.70	155	8.91	691	0.01	0.05	0.0	L5			
HALEAKALA, MAUI	HKLZ	20	42.63	156	15.55	3051	0.00	0.00	0.0	S13			
HILINA PALI	HLPV	19	17.96	155	18.63	707	0.02	0.07	2.1	L5		D	
HONOLULU, OAHU	HONZ	21	19.30	158	0.50	2	0.00	0.00	0.0	S13			
HONOLULU, OAHU	HONE	21	19.30	158	0.50	2	0.00	0.00	0.0	S13			
HONOLULU, OAHU	HONN	21	19.30	158	0.50	2	0.00	0.00	0.0	S13			
HONUAPO	HPOZ	19	5.34	155	33.23	15	0.00	0.00	0.0	S13			
HALE POHAKU	HPUV	19	46.85	155	27.50	3396	0.31	0.17	3.3	L5			
HUMUULA SHEEP	HSSV	19	36.31	155	29.13	2445	0.20	0.35	4.0	L5			
HUMUULA SHEEP	HSSE	19	36.31	155	29.13	2445	0.20	0.35	3.0	L5	MW		
HUMUULA SHEEP	HSSN	19	36.31	155	29.13	2445	0.20	0.35	3.0	L5	MW		
HOT CAVES	HTCV	19	14.33	155	24.02	381	-0.16	-0.07	2.3	E4			
HUALALAI	HUAV	19	41.25	155	50.32	2189	0.67	0.38	2.8	L5		I	
HEIHEIAHULU	HULV	19	25.13	154	58.72	369	-0.17	-0.16	1.6	L5		DI	
HEIHEIAHULU	HULE	19	25.13	154	58.72	369	-0.17	-0.16	3.0	E5	MW		
HEIHEIAHULU	HULN	19	25.13	154	58.72	369	-0.17	-0.16	3.0	L5	MW		
KAAPUNA	KAAV	19	15.98	155	52.28	524	-0.12	-0.01	3.3	E5			
KAENA POINT	KAEV	19	17.35	155	7.95	37	-0.01	0.06	1.4	L5			
KAOIKI FAULTS	KFAV	19	25.25	155	25.18	1579	0.13	0.17	0.0	L5			
KAHUKU	KHUV	19	14.90	155	37.10	1939	0.03	-0.03	5.0	E5			
KANEKII	KIIV	19	30.56	155	45.90	1841	0.15	0.37	3.0	L5			
KANEKII	KIIE	19	30.56	155	45.90	1841	0.15	0.37	3.0	L5	MW		
KANEKII	KIIN	19	30.56	155	45.90	1841	0.15	0.37	3.0	L5	MW		
KIPAPA, OAHU	KIPZ	21	25.40	158	0.90	2	0.00	0.00	0.0	S13			
KAILUA, KONA	KKHZ	19	39.40	156	1.12	1	0.00	0.00	0.0	S13			
KEANAKOLU	KKUV	19	53.39	155	20.58	1863	0.68	0.24	3.3	L5			
KALALUA CONE	KLCV	19	24.35	155	4.08	659	-0.25	-0.30	3.4	L5			
PUU KALIU	KLUV	19	27.48	154	55.26	271	-0.17	-0.30	3.4	L5			
KOHALA	KOHV	20	7.69	155	46.77	1166	-0.03	-0.17	6.3	L5			
KOHALA	KOHE	20	7.69	155	46.77	1166	-0.03	-0.17	3.0	L5	MW		
KOHALA	KOHN	20	7.69	155	46.77	1166	-0.03	-0.17	3.0	L5	MW		
KAPOHO CONE	KPCZ	19	30.02	154	50.51	134	0.00	0.00	0.0	S13		D	
KIPUKA NENE	KPNV	19	20.10	155	17.40	924	-0.11	-0.08	3.5	L5		D	
KAPOHO	KPOV	19	30.02	154	50.51	134	-0.09	-0.24	1.9	L5			
LAUPAHOEOHOE	LPHZ	19	59.82	155	14.58	1	0.00	0.00	0.0	S13			
MAHUKONA	MHAZ	20	11.27	155	54.18	1	0.00	0.00	0.0	S13			

MAUNA LOA	MLOV	19	29.80	155	23.30	2010	0.03	0.08	5.6	L5	DI
MAUNA LOA	MLOE	19	29.80	155	23.30	2010	0.03	0.08	3.0	L5	MW
MAUNA LOA	MLON	19	29.80	155	23.30	2010	0.03	0.08	3.0	L5	MW
MAUNA LOA X	MLXV	19	27.60	155	20.70	1475	0.06	0.15	3.0	L5	
MOKUAWEOEWO	MOKV	19	29.28	155	35.98	4104	0.15	0.16	4.2	L5	DI
MAKAOPUHI	MPRV	19	22.07	155	9.85	881	-0.17	-0.20	2.6	L5	DI
MAKAOPUHI	MPRZ	19	22.07	155	9.85	881	-0.17	-0.20	0.1	L5	
NATIONAL GUARD	NAGV	19	42.12	155	1.72	18	0.54	0.30	4.0	R5	
NATIONAL GUARD	NAGE	19	42.12	155	1.72	18	0.54	0.30	3.0	R5	MW
NATIONAL GUARD	NAGN	19	42.12	155	1.72	18	0.54	0.30	3.0	R5	MW
NORTH PIT	NPTV	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L5	DI
NORTH PIT	NPTE	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L5	MW
NORTH PIT	NPTN	19	24.90	155	17.00	1115	-0.30	-0.18	3.0	L5	MW
OOKA	OKAV	19	29.66	154	55.44	180	0.00	0.00	0.0	L5	
OPANA, OAHU	OPAZ	21	41.45	158	0.70	100	0.00	0.00	0.0	S13	
OUTLET	OTLV	19	23.38	155	16.94	1038	-0.19	-0.18	2.6	L5	
OUTLET	OTLZ	19	23.38	155	16.94	1038	-0.19	-0.18	0.0	L5	
OCEANVIEW EST	OVEV	19	9.21	155	45.92	1378	0.00	0.00	0.0	L5	
PAUAHI	PAUV	19	22.62	155	13.10	994	-0.21	-0.24	2.9	L4	D
PAUAHI	PAUE	19	22.62	155	13.10	994	-0.21	-0.24	3.0	L5	MW
PAUAHI	PAUN	19	22.62	155	13.10	994	-0.21	-0.24	3.0	L5	MW
PUU ULAULA	PLAV	19	32.00	155	27.67	2992	-0.03	0.13	6.3	L5	DI
POHOIKI	POIV	19	27.42	154	51.22	16	-0.09	-0.24	0.0	L5	
POLIOKEAWE PALI	POLV	19	17.02	155	13.47	169	-0.02	0.03	3.4	E5	
PUU PILI	PPLV	19	9.50	155	27.87	35	-0.15	-0.15	1.4	E5	D
RED CONE	RCOV	19	24.36	155	37.79	3601	0.00	0.00	0.0	L5	
RIM	RIMV	19	23.90	155	16.60	1128	-0.21	-0.13	0.0	L5	
RAINSHED	RSDV	19	27.78	155	16.68	1270	0.06	0.15	0.0	L5	
SOUTH POINT	SPTV	18	58.91	155	39.92	244	-0.17	-0.22	2.8	L5	
SOUTH POINT	SPTE	18	58.91	155	39.92	244	-0.17	-0.22	3.0	L5	MW
SOUTH POINT	SPTN	18	58.91	155	39.92	244	-0.17	-0.22	3.0	L5	MW
STEAM CRACKS	STCV	19	23.30	155	7.67	765	-0.25	-0.30	3.4	L5	DH
STEAM CRACKS	STCE	19	23.30	155	7.67	765	-0.25	-0.30	3.0	L5	MW
STEAM CRACKS	STCN	19	23.30	155	7.67	765	-0.25	-0.30	3.0	L5	MW
SOUTHWEST RIFT	SWRV	19	27.26	155	36.30	4048	0.01	0.04	5.6	E5	D
TRAIL	TRAV	19	24.91	155	32.96	3207	0.00	0.00	0.0	L5	
UWEKAHUNA	URAV	19	25.40	155	17.60	1240	-0.21	0.00	0.0	R5	
UWEKAHUNA	URAE	19	25.40	155	17.60	1240	-0.21	0.00	3.0	R5	MW
UWEKAHUNA	URAN	19	25.40	155	17.60	1240	-0.21	0.00	3.0	R5	MW
UWEKAHUNA	UGZ	19	25.40	155	17.60	1240	0.00	0.00	0.0	L0	
UWEKAHUNA	UWAZ	19	25.40	155	17.60	1240	0.00	0.00	0.0	F0	
UWEKAHUNA	UWAE	19	25.40	155	17.60	1240	0.00	0.00	0.0	F0	
UWEKAHUNA	UWAN	19	25.40	155	17.60	1240	0.00	0.00	0.0	F0	
WAIKII	WAIV	19	51.58	155	39.60	1433	0.20	0.35	0.0	L5	
WILKES CAMP	WILV	19	28.15	155	35.02	4037	0.22	0.17	2.6	E5	D
WILKES CAMP	WILE	19	28.15	155	35.02	4037	0.22	0.17	3.0	L5	MW
WILKES CAMP	WILN	19	28.15	155	35.02	4037	0.22	0.17	3.0	L5	MW
WAIMANALO RG, OA	WMRZ	21	19.22	157	40.94	200	0.00	0.00	0.0	S13	
WEATHER OBSERV	WOBV	19	32.31	155	35.01	3396	0.00	0.00	0.0	E5	
WOOD VALLEY	WOOV	19	15.08	155	30.12	909	-0.15	-0.06	2.6	E5	

Table 2. Seismic instrument types

The codes in parentheses refer to the seismometer types listed in Table 1.

Type 1 (Codes E, L, R, and 4, 5) consists of:

- a) Geophone - Electrotech EV-17 (E), Mark Products L4C (L) or Kinematic Ranger SS1 (R). (L) and (R) are 1.0-sec. period moving-magnet vertical- or horizontal- (E-W and N-S) component seismometers adjusted for an output of 0.5 volts/cm/sec and 0.8, critically damped.
- b) Preamp/VCO - USGS/OEVE Model J402 (4), J502 (5) voltage-controlled oscillator. Three db points for bandpass filter at 0.1 Hz and 30 Hz. Signals are transmitted on audio FM carrier over cable or FM radio link to HVO.

Code (W) - Wood-Anderson torsion seismograph.

Code (MW) - Horizontal-component seismograph based on a Type 1 system and modified to 3x a Wood-Anderson response.

Code (F) - Kinematic Force-Balance Accelerometer (FBA23).

Code (S13) - Geotech, 1Hz seismometer with A1 VCO operated by the Pacific Tsunami Warning Center.

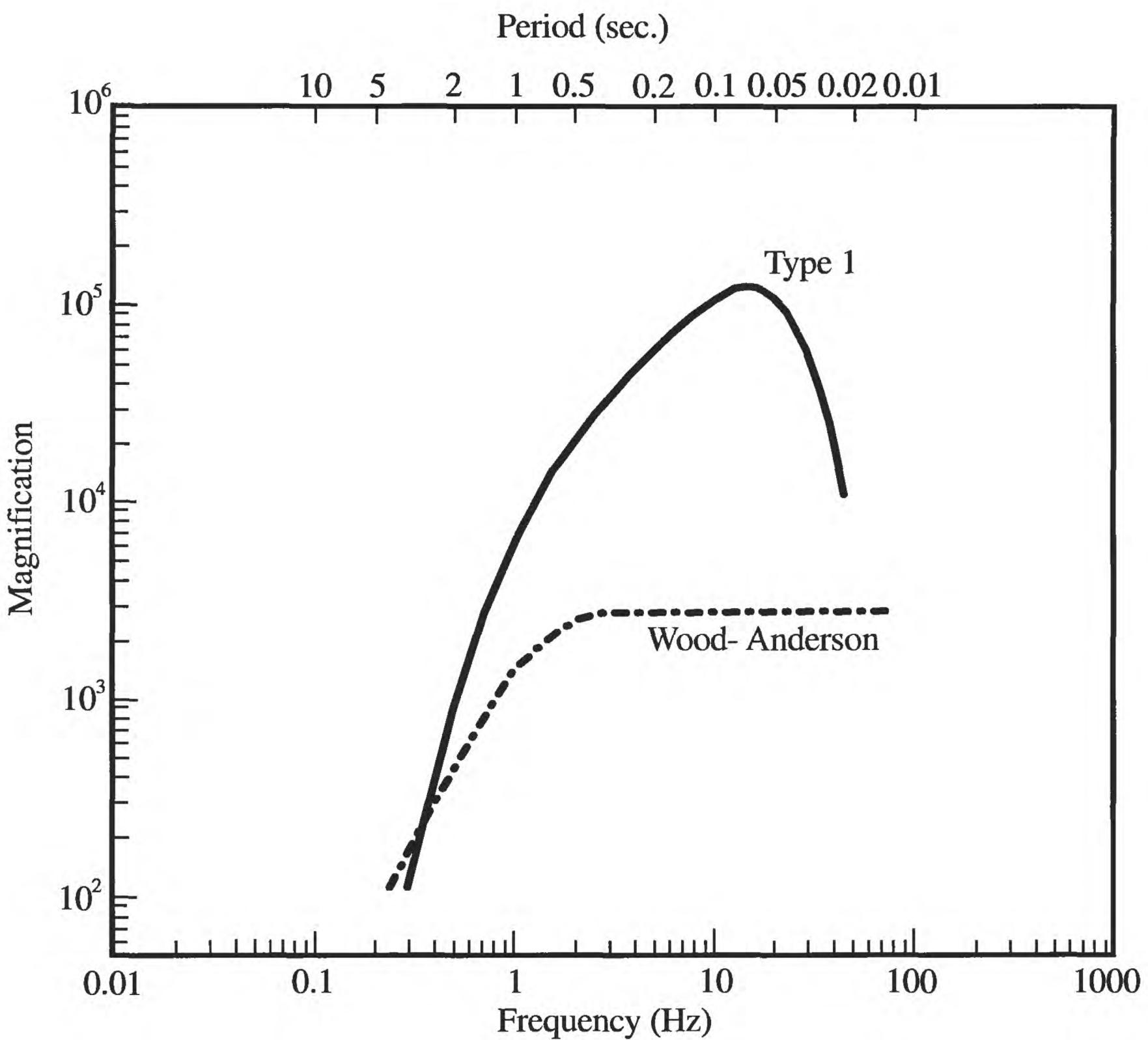


Figure 5. System-response curves for the Wood-Anderson torsion seismograph and for seismometers used by the Hawaiian Volcano Observatory. Type 1 is the standard OEVE seismometer system recorded on Develocorder film and DAT tape. The curve for Type 1 includes response of the geophone, all electronics including telemetry, Develocorder galvanometer, and projection of film by a 20x viewer. The curve plots the unit response, which should be multiplied by a constant but known factor (CAL) to get the response for an individual station.

SEISMIC DATA PROCESSING

The Developorder 'A' film is scanned on a daily basis for frequency of earthquakes, and coda durations in seconds are measured for coda magnitude M_d . In 1986, HVO acquired a VAX 11-750 computer and adopted the CUSP (California Institute of Technology USGS Seismic Processing) routine. Discriminated analog signals are converted to digital form, and detected events are saved in real time. Detected events are demultiplexed, and P-picks are made by the computer, producing a rough location. Events are examined by an analyst, on a VAX workstation, to refine computer P-picks and to time additional P- and S-phases for a preliminary location. Binary CUSP files are tape-archived and translated into ASCII phase files. Locations and amplitude magnitudes are then determined, using the program HYPOINVERSE (Klein, 1989)². Events are reworked and rerun, as needed, to produce a final solution. Magneto-optical copies of arrival times and output summary data are kept at HVO.

In July 1992, HVO acquired VAX workstations for timing earthquakes using a "generic" version of CUSP. In addition to timing P and S arrival signals, the VAX workstations are capable of measuring peak-to-peak amplitudes along with the associated period. This capability allowed the renewal of amplitude magnitude determinations from the network seismic stations. Amplitude data gathered from July 1992 to July 1997 became part of a test set to determine magnitude corrections for network stations. Results of newly determined magnitude corrections are detailed by Nakata and Okubo (1997)³.

The crustal model used is specified by velocities at four depth points. Velocity at any depth is given by linear interpolation between points and uses a homogeneous half-space, as listed below:

VELOCITY (km/sec)	DEPTH (km)
1.9	0.0
6.5	4.6
6.9	15.0
8.3	16.5

Two empirical sets of station delays or corrections were used in the HYPOINVERSE locations and are given in Table 1. The delay models are separated by a circle of radius 34 km, centered at 19°22' N and 155°10' W. Delay model 1 is used for epicenters occurring within a circle of radius 31 km from the center. This region includes Kilauea and its south flank. A combination of the two delay models is used for epicenters that fall in a transition zone that is 6 km wide. Delay model 2 is applied to the rest of the island and offshore earthquakes. (For a detailed description, refer to Klein, (1989)².

Magnitudes for events are computed using recorded amplitudes on selected network vertical, Modified Wood-Anderson (MW) horizontal, and/or moderate and low gain stations. Amplitude readings are corrected to an equivalent Wood-Anderson amplitude using the curves of Figure 5 and CAL factors listed in Table 1.

Duration magnitude is determined by the length of signal, in seconds, from Type 1 seismographs read from the developorder viewer. This length of time, also called "F-P time," is measured from the P arrival to the point where the earthquake signal has decayed to nearly the background noise level. A bilinear relation used to compute duration magnitude is described in Klein, (1989)².

² Klein, F.W., 1989, User's guide to HYPOINVERSE: U.S. Geological Survey Open-File Report 89-314, 58 p.

³ Nakata, J., and Okubo, P., 1997, Determination of station amplitude magnitude corrections for the Hawaiian Volcano Observatory telemetered seismograph network: Data from 1992-1997: U.S. Geological Survey Open-File Report 97-863, 73 p.

SEISMIC CATALOG

The emphasis in both station coverage and detailed data analysis is on the highly active south half of the Island of Hawai'i. Hundreds of earthquakes too small to locate are classified as to type⁴ and counted daily. The set of well-recorded earthquakes located in the Hawai'i Island region is nearly complete above magnitude 2.0. Many smaller events are located in the densely instrumented Kilauea area. Substantial effort is made to locate earthquakes elsewhere within the Hawaiian Archipelago. Such coverage cannot be as complete as in south Hawai'i, but nearly all events above magnitude 4.0 are located with limited precision.

Data presented in the seismic catalog are in four parts: (1) Table 3 gives duration of harmonic tremor and numbers of earthquakes (most too small to locate) from several source regions around Kilauea and Mauna Loa. The source region is determined visually from signal character and pattern of arrival times at key stations. (2) Maps showing computer-located hypocenters are given in Figures 10-23. The location maps are of different scales and provide hypocenters with magnitude thresholds set at 1.0, 2.0, 3.0, and 3.5, varying according to region. (3) The list of computer locations constitutes the bulk of this summary and is given in Table 5. Each earthquake in the list is assigned a three-letter code based on its general location and depth. Figures 6-9 are maps of the regions used to assign the location codes. The latitude and longitude limits of rectangular regions are listed in Table 4. When the listed coordinates overlap, precedence is given according to Figures 6-9. (4) Table 6 re-lists the events in Table 5 for which the preferred magnitude is 3.0 or larger. This list includes many of the earthquakes felt in Hawai'i.

Table 3. Number of earthquakes and minutes of tremor recorded on seismographs around Kilauea and Mauna Loa.

Earthquake categories are as follows:

- 1) Kilauea summit, short-period caldera: shallow earthquakes beneath the caldera.
- 2) Kilauea summit, long-period caldera A: earthquakes characterized by low frequency signatures of 3 to 5 Hz, often originating 0-5 km beneath the summit.
- 3) Kilauea summit, long-period caldera B: earthquakes characterized by low frequency signatures of 1 to 3 Hz, often originating 0-5 km beneath the summit.
- 4) Kilauea summit, long-period caldera C: earthquakes characterized by low frequency signatures of 1 to 5 Hz, often originating 5-15 km beneath the summit.
- 5) Kilauea summit 30 km: earthquakes about 30 km deep beneath the summit region.
- 6) Ka'oihi and southwest rift: earthquakes beneath the southwest rift zone of Kilauea, western parts of the Koa'e fault system, and adjacent Ka'oihi fault system of Mauna Loa.
- 7) Upper east rift: earthquakes in the upper and middle east rift zones, the adjacent parts of the south flank, and eastern parts of the Koa'e fault system.
- 8) Lower east rift: earthquakes in the lower east rift zone and adjacent parts of the south flank.
- 9) Mauna Loa short-period: shallow earthquakes in the Mauna Loa summit region.
- 10) Mauna Loa long-period: earthquakes characterized by low-frequency signatures near the summit region.
- 11) Mauna Loa northeast rift: earthquakes beneath the northeast rift zone of Mauna Loa.
- 12-15) Tremor is separated into four categories: Kilauea—shallow, intermediate, and deep, and Mauna Loa. Depth is inferred on the basis of relative amplitudes on seismographs.

The criteria for Kilauea shallow tremor have been changed to accommodate the ongoing eruption for which tremor in the middle east rift zone is continuous. Distinction is made between high-amplitude tremor related to strong eruptive periods and low-amplitude tremor during periods with no surface lava production. Only minutes of tremor at saturated levels recorded locally at STC and/or KLC are included in Table 3.

⁴ Koyanagi, R.Y., 1982, Procedure for routine analyses and classification of seismic events at the Hawaiian Volcano Observatory, Part I: U.S. Geological Survey Open-File Report 82-625, 32 p.; figs., 59 p.

Table 3. KILAUEA SUMMIT **KILAUEA FLANK** **MAUNA LOA** **TREMOR (MINUTES)**

DATE 1996	SHORT PER. CALD.	LONG PER. CALDERA A	PERIOD CALDERA B	30 KM C	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	MAUNA LOA NE RIFT	KILAUEA SHAL. INT. DEEP	MAUNA LOA
JAN 1*										1440
2*										1440
3*										1440
4*										1440
5*										1440
6*										1440
7*										1440
8*										1440
9*										1440
10		38			10	12		5	5	1440
11		48	4		14	32	3	3	3	1440
12		47			24	20	1	4	3	1440
13		36	17		12	19	3	4	1	1440
14		58	1	8	16	23		6	2	1440
15	2	58			6	26		1	2	1440
16		39	1		10	15	1	5	3	1440
17		74		1	21	35	1		8	2
18	1	49	21		5	25	1	1	1	1440
19		114	5		9	27	6	2	2	1440
20		53			28	18	5		7	2
21		57			17	16	6	1	3	1440
22		45			18	12	1	2	3	1440
23	1	71	2	2	16	22	2	8	6	2
24		76	1		11	18	1		1	1440
25		98			16	21	2	1	8	6
26	2	66		1	31	24			3	1440
28*										1440
27	2	46			15	8	1	6	8	5
29	2	88		9	16	35			9	12
30	3	80		8	18	21	1	1	1	1440
31	1	20	2	1	3	4		3	3	1440
FEB 1	580	168	48	208	6	119				1440
2		10		44	8	25	1	1	1	1440
3		3		25	6	18		1	4	1440
4	4	6		5	13	19		3	1	5
5		8	8		12	22		3	1	2
6	2	7		7	11	17		1		1
7	4	11		5	4	15	1	1	1	2
8	1	17		3	7	22	1	3		1
9	1	17		9	11	35			4	34
										37
10		8		3	8	26		3		
11	1	67		1	6	45			1	
12	2	13		4	11	46				
13	3	16		10	9	80	1		3	480
14	1	7		6	10	16		1	1440	29
15					8	20		1		1440
16		13		1	14	21		2		1440
17	2	19		3	7	41	1	8		1440
18	2	15		4	12	28		3		1440
19	1	8		3	26	25		6	1	2
20	1	8		16	10	14		4	3	1440
21		12		21	12	20		3		1440
22		10		26	22	12		3	2	1440
23		5		17	18	12		6	2	1440
24	3	18		15	11	20		1	3	1440

KILAUEA SUMMIT					KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)		
DATE 1996	SHORT PER. CALD.	LONG CALDERA A	PERIOD CALDERA B	30 KM C	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA LOA INT.	MAUNA LOA DEEP
FEB 25	2	13		13	11	19		6	2	1	1440		6
26		23		9	15	22	1	6		2	1440		
27*											1440		
28	1	11		16	11	23		5		4	1440		67
29		17		10	9	13		11	1	5	1440		
MAR 1	1	29		18	21	31	4	11	1	3	1440		
2	1	46		12	10	18		7	1	1	1440		
3	4	32		13	6	14					1440		
4	3	100		7	9	44	1	6	1		1440		
5	1	181		12	6	50	1				1440		
6	2	68		10	10	47	1				1440		
7	1	58		10	13	40	2	7	1	2	1440		
8	1	43	289		21	28		8	1	4	1440		28
9	1	65	1	13	12	26	1	9	3	3	1440		
10		43		15	13	22		10		6	1440		
11	2	38	4	8	9	16		8	1	1	1440		
12	1	27		5	14	22		10		3	1440		4
13	1	26			11	18	1	7		1	1440		
14	1	24			12	23		8	1	1	1440		161
15*											1440		
16*		18			10	9		3		1	1440		
17*											1440		
18*											1440		
19		113			16	23	3	5	1	3	1440		40
20*		285			14	14	4	8	1	1	1440		
21	1	731	1		5	23	4	3		3	1440		
22		881			15	23	3	3	1		1440		
23	1	1750			13	13	1	1		1	1440		
24	5	319		5	15	62	6	4	3	1	1440		
25	1	55	1		8	31	1	25			1440		
26*					9	14	3				1440		
27		119	1		12	14		6		1	1440		
28		31			8	19	3	9	1	1	1440		
29	1	31			8	20	3	6	1	1	1440		
30		19						7		1	1440		
31		14			9	16		4	3		1440		10
APR 1		13	1		16	13	2	4	1		1440		
2		23			11	25		3		1	1440		22
3		22			5	19	2	4		3	1440		
4		17			11	12	1	3		1	1440		
5		19			10	17	4	3		2	1440		7
6*					7	8	2	4			1440		
7*		4			23	32	8	5	3		1440		28
8	1	27			14	24		11			1440		
9		19		1							1440		
10	1	24			19	32	1	4	1		1440		
11		14			17	16	1	9	1		1440		40
12	2	16			19	21	1	7	1	1	1440		
13		13			12	11		2	2	4	1440		14
14		19	1		12	21	1	2		2	1440		
15		15			11	19	5	7	4	1	1440		
16	3	21			7	17		4	1	1	1440		
17	1	27			9	21		7	1	2	1440		
18	1	17	1	1	10	18	2	3			1440		32
19		21			5	20	1	2		1	1440		

KILAUEA SUMMIT					KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)		
DATE 1996	SHORT PER. CALD.	LONG CALDERA A	PERIOD C	30 KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA LOA INT. DEEP	
APR 20*											1440		
21		10									1440		
22		10									1440		
23		13		1							1440		
24		18		1							1440		
25		14									1440		
26		16									1440	6	
27		1	7								1440		
28		1	9								1440		
29		11									1440		
30		7									1440		
MAY 1		1	4								1440		
2		1	23								1440		
3*											1440		
4*											1440		
5*		8									1440		
6		9									1440		
7		1	5	1							1440	32	
8		1	48	4							1440	49	
9		2	20	6							1440		
10		23		1							1440	26	
11		31	1								1440		
12		3	17		1						1440		
13		18			1						1440		
14		15									1440		
15		23									1440		
16		1	14								1440		
17		1	15								1440	36	
18		22									1440		
19		13									1440		
20		33	11	2							1440		
21		87	117								1440	3	
22		41	108								1440		
23		2	37	1							1440		
24		21	2		1						1440		
25		19	8								1440		
26		1	16								1440		
27		2	21								1440		
28		15									1440		
29		1	15								1440		
30		9	54								300	20	
31		2	99	2									
JUN 1		4	68	2								10	
2		6	80									9	
3		7	105	1								5	
4		5	71								1350		
5		1	30								1440		
6		3	28								1440		
7		3	11	1							1440		
8		2	30		1						1440	9	
9		4	21		1						1440		
10		23									1440		
11		29									1440	71	
12		1	18	3							1440		
13		27									1440	4	
												5	

KILAUEA SUMMIT					KILAUEA FLANK			MAUNA LOA			TREMOR (MINUTES)		
DATE 1996	SHORT PER. CALD.	LONG CALDERA A	PERIOD B	30 KM C	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA LOA INT. DEEP	
JUN 14		16	1		13	28		1		2	1440		
15	1	18			17	18		4		3	1440		
16		23		2	26	25		4		4	1440		
17		16			13	29	2	4		2	1440		
18		32	1		19	19	2	2			1440	2	
19	1	30			13	32	2	6		3	1440		
20		19			21	35	2	4		5	1440		
21	1	30			21	31	3	7	1	3	1440		
22		19	1		16	33	3	7		3	1440		
23		21		1	25	38	3	4		5	1440		
24*					14	27	1	3		4	1440		
25	1	21			15	19	2	7	1		1440	20	
26		17			16	33	2	1	1		1440		
27		17			18	25	1	2	2	6	1440		
28		17								3	1440		
29		13			13	27				2	1440		
30	1	14	1	1	19	29	5			4	1440		
JUL 1	2	22			19	28	2	6	1	2	1440		
2		24		1	17	30	1	5		2	1440		
3	1	26			13	28	2	1		7	1440		
4	1	31			16	22	1	4	1	4	1440	40	
5		18			17	28	2	2		6	1440		
6	1	21			12	22	1	2		4	1440		
7		29			24	30	3	3		2	1440		
8	1	14			13	29	1	8	6	1	1440	38	
9	1	28			18	34	2	2		5	1440		
10	5	12			18	22	2	2		3	1440		
11	2	12		3	23	27		2			1440	17	
12	1	11		45	17	34	1	3		2	1440		
13	1	24	1		18	18	1	4		2	1440	4	
14		10		1	15	14	1	4	1	1	1440		
15	1	21			15	27				2	1440		
16	3	22			11	21		4		2	1440	60	
17		17	2		10	33	2	2		2	1440	10	
18		25			12	23	1	6		5	1440	5	
19		41			15	37	4	1		5	1440		
20	1	24		1	13	36	1	2		4	1440		
21		10			15	21	2	6		5	1440		
22		14			24	21	1	1			1440		
23		16			5	18		3		1	1440		
24	1	32			9	28		4		3	1440	11	
25		44			16	17		4		1	1440	6	
26		32			5	34	1	4		2	1440	4	
27		16		1	5	14		1		1	1440		
28		16		2	10	11		1			1440		
29		6	3	132	12	10		1		3	1440		
30	1	22	1	98	15	16		3		3	1440		
31	2	14		21	8	17		3	1	3	1440	45	
AUG 1		36	8	21	20	34	1	3		3	1440		
2		32	14	11	25	23		6	1	4	1440		
3		37	4	12	15	17	1	2		5	1440		
4	1	8	16		14	30		4		2	1440		
5		17	37		28	27	2	4		3	1440	5	
6		16	35		7	45	2			3	1440		
7		23	19	1	14	25		3		3	1440		

KILAUEA SUMMIT					KILAUEA FLANK				MAUNA LOA				TREMOR (MINUTES)		
DATE 1996	SHORT PER. CALD.	LONG PERIOD CALDERA	PERIOD A	PERIOD B	PERIOD C	30 KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER. RIFT	LONG PER. RIFT	NE RIFT	KILAUEA SHAL.	MAUNA INT.	MAUNA LOA DEEP
AUG 8		11	35				27	41	1	3	1	1	1440		
9		23	43	9			20	36	2				1440		
10		42	42	11			21	14		2	2		1440		
11		11	31	10			21	25				3	1440		
12		17	28	15			14	29	1	1		2	1440		
13	1	10	72	5			10	13	3	1			1440		
14		25	20	18			8	20		1		3	1440		
15		18	10	26			16	21		3		3	1440		
16	1	21	12	5			17	42	1	6		2	1440		
17		17	10	4			19	41	1				1440		
18		17	5	5			18	20	4	1	2	2	1440		
19		37	1	15			18	21		6			1440		38
20	1	29	14	9			21	27		6		2	1440		
21		29	51	14			11	25		3	1		1440		
22		35	15	17			20	39	2	2	1	1	1440		
23		35		17			22	34		2	1		1440		7
24		57	3	14			11	28	1	1	1	3	1440		
25		22	1	2			19	35	2	1		3	1440		
26		53		3			17	28				1	1440		13
27	6	38		1			8	25	1		2	1	1440		
28		26					13	24		3		5	1440		
29		16	1	1			21	24		2		3	1440		25
30	1	7		1	1		21	34	2	2		2	1440		8
31		12					19	41		4		2	1440		33
SEP 1		8		1			11	37	1			3	1440		34
2		8					18	26	1	3		3	1440		
3		29		2			13	26	3	1			1440		32
4	3	15	1	3			16	29		4			1440		
5	4	20					10	24	2	3		3	1440		
6		44	4				22	20		5		2	1440		
7		25		2			10	30				1	1440		15
8		33	1				10	20	1				1440		
9		21	14				14	16	3	1			1440		64
10	1	11	24				14	18		4		1	1440		14
11	7	22	27				18	27	1	1		1	1440		
12	2	14	15	1			22	10				1	1440		
13		26	17	1			22	18	2	1	1		1440		25
14	1	22	20	2			14	15	1	4	4	1	1440		
15		7	18	1			23	18		1	1		1440		
16	2	11	31				15	25		2			1440		
17	3	13	162	1			9	23	2	1		2	1440		20
18	2	21	22				9	20		1	1		1440		
19	2	21	7	8			19	37	2				1440	2	28
20	3	23	19				12	30		5		6	1440		5
21	7	22	13	2			19	27		1	1	2	1440		
22	5	24		2			7	29	1	4	12		1440		
23	3	52	4	2			24	29	1	1	7		1440		9
24	4	34	1	3			7	35	1	1			1440		12
25	1	55	2				15	37		5	46	1	1440		
26	4	49	40	1			22	25	2	2	27	1	1440		
27	2	31	247				25	28		3	19	1	1440		
28	3	19	415				14	27		3	22		1440		
29	1	22	242	2			21	30		3	16		1440		32
30	1	31	122				13	38	1	3	6		1440		11
OCT 1		53	280				13	33		5	6	3	1440		

KILAUEA SUMMIT					KILAUEA FLANK				MAUNA LOA				TREMOR (MINUTES)		
DATE 1996	SHORT PER. CALD.	LONG PERIOD CALDERA	PERIOD CALDERA	30 KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA INT.	MAUNA LOA DEEP		
OCT 2		10	249	2	18	12		3	3		1440		57		
3	2	53	94	1	23	18		4	5		1440				
4		100	30	3	14	24		6		2	1440				
5	2	24	44	1	16	22	2	3		2	1440				
6	2	21	21	2	19	16	1		6	2	1440				
7		37	31	4	14	24	1	6		1	144				
8		52		111	19	14		3		1	1440		12		
9	1	19	1	99	19	7		3	1	1	1440				
10	3	25	6	19	19	19	1		1	1	1440				
11		15	9	3	19	21		2	3	2	1440				
12		17	70	2	18	15		2			1440				
13	1	21	13		17	16		1	1	3	1440		3		
14	1	18	1		19	18			1	2	1440				
15		19	2	4	16	28	1	4	1	2	1440				
16		22		2	16	24		7	1	1	1440		35		
17	2	35	1	3	19	27		5	3		1440				
18	3	52	1	4	16	23	17	1		1	1440				
19	7	65	6	4	12	23		5	3		1440				
20	9	30	18	3	23	36	1	1		1	1440				
21	2	44	24	4	18	28		2		2	1440				
22		24	43	1	21	9			4		1440				
23		18	7	3	16	9		3		1	1440				
24	4	51	33	7	9	25		2	1	1	1440				
25	2	42	1	9	9	294		3	1	1	1441		84		
26		102	4	2	10	64		1		1	1440		9		
27	2	57	4	11	14	31		5	2	1	1440				
28	1	39	2	63	25	28			1	1	1440				
29	4	23	1	29	20	38		1			1440				
30		25		31	11	20	1	1			1440				
31	2	42	1	17	5	26	2	4	3		1440				
NOV 1	1	41	40	12	15	28	2	5	1	1	1440				
2		25	6	16	16	19	1	5	1	2	1440				
3		32	5	21	21	26		9	1		1440		28		
4	2	28		67	14	24		6		3	1440				
5		23	6	19	18	16		3	1	3	1440				
6	1	28	3	50	15	29		6	1	3	1440				
7	1	31	27	78	27	31		5			1440				
8		24		64	13	23	1	4		1	1440				
9		25	4	33	11	20		1	1	1	1440				
10	2	23	10	20	18	28		1	1	1	1440				
11	1	28	12	46	15	29		4	1	2	1440				
12	2	62	2	30	13	13	1	5	1		1440				
13	3	75	72	111	20	24		2		1	1440		14		
14	1	57	24	39	14	39		4	2		1440				
15	4	57	16	85	21	24	1	1			1440				
16	1	47	32	48	14	23		2		1	1440				
17	2	32	8	76	29	24		1		1	1440				
18	5	50		20	19	33		1	1	3					
19	1	57		122	16	21		1			1440				
20	2	44		59	17	17		2			1440				
21	1	30	3	21	18	18					1440				
22		52	3	23	12	14		2	1		1440				
23	1	30		23	15	26	1	3			1440				
24		23	17	15	15	35		21			1440				
25		18	28	9	20	25		6			1440				

KILAUEA SUMMIT				KILAUEA FLANK				MAUNA LOA				TREMOR (MINUTES)		
DATE 1996	SHORT PER. CALD.	LONG PERIOD CALDERA	30 KM	KAO. & SW RIFT	UP. EAST RIFT	LOW. EAST RIFT	NE RIFT	SHORT PER.	LONG PER.	NE RIFT	KILAUEA SHAL.	MAUNA LOA		
	A	B	C								INT.	DEEP		
NOV 26	2	26	8	13		28	20		2	2	1	1440		
27		23	23	10		22	5		4		1	1440		
28		21	11	11		16	16		1		6	1440		
29	2	18	16	10		12	15		1	1	2	1440		
30		10		8		15	18		4	1	1	1440		
DEC 1	1	26	2	13		15	21				3	1440		
2		26	3	30		18	22		5		1	1440		
3	2	22		11		24	12		3			1440		
4	2	10	2	13		17	15		1		6	1440		
5		8	3	8		11	34		2	1		1440		
6	4	8	6	8		17	21	1	6	1	1	1440		
7	2	10	1			15	6		3			1440		
8	2	19	5	2		15	66		2	1		1440		
9	2	35	1	1		17	27		8	1		1440		
10		19	13	5		20	29		5			1440		
11	1	21		3		15	24		6	1		1440		
12	1	9	10	1		12	17		3			1440		
13	2	13	4	3		16	28		1		2	1440		
14	1	16	8	3		17	28				2	1440		
15	2	18				20	28					1440		
16*		15	2	1	1	6	10		2		1	1440		
17	1	16				25	24	1	3		1	1440		
18	1	9		4		15	25	1	6	1		1440		
19	2	16	10	2		15	21	3	7		1	1440		
20		17		2		26	20	4	8		3	1440		
21	2	29	1			21	12	2	2		1	1440		
22	1	16		1		17	15	2	3			1440		
23	1	5				5	2	1				1440		
24	3	7		2		9	11	2				1440		
25		16		1	1	12	12	2	1			1440		
26		8	1			20	12	2	1			1440		
27		7				7	24	2				1440		
28	5	7			1	11	13					1440		
29	2	5			2	12	5	3	1			1440		
30	2	3				9	13		1			1440		
31*		2				9	7					1440		

*Data incomplete - station(s) or recorder not in operation.

Table 4. Names and coordinates of regions used for classifying earthquakes.

All earthquakes locate in one of the following groups, identified by a numerical class or three-letter code:

—Shallow:

- 1 SNC - Shallow north caldera (0-5 km)
- 2 SSC - Shallow south caldera (0-5 km)
- 3 SEC - Shallow east caldera (0-5 km)
- 4 SER - Shallow east rift (0-5 km)
- 5 SME - Shallow middle east rift (0-5 km)
- 6 KOA - Koa‘e fault zone (0-5 km)
- 7 SSF - Shallow south flank (0-5 km)
- 8 SLE - Shallow lower east rift (0-5 km)

—Intermediate depth:

- 9 SF1 - Kilauea south flank (5-13 km) (west end)
- 10 SF2 - Kilauea south flank (5-13 km)
- 11 SF3 - Kilauea south flank (5-13 km)
- 12 SF4 - Kilauea south flank (5-13 km)
- 13 SF5 - Kilauea south flank (5-13 km) (east end)
- 14 LER - Lower east rift (5-99 km)
- 15 MLO - Mauna Loa (0-13 km)
- 16 LSW - Lower southwest rift zones of Kilauea and Mauna Loa (0-13 km)
- 17 GLN - Glenwood (0-13 km)
- 18 SWR - Southwest rift zone of Kilauea (0-13 km)
- 19 INT - Intermediate caldera (5-13 km)
- 20 KAO - Ka‘oiki (0-13 km)

—Deep:

- 21 DEP - Deep Kilauea (>13 km) (below regions 1-13, 17-19)
- 22 DLS - Deep lower southwest rift zone of Kilauea and Mauna Loa (>13 km) (below region 16)
- 23 DML - Deep Mauna Loa (>13 km) (below regions 15, 20)

—Outer regions, all depths:

- 24 LOI - Lo‘ihi
- 25 KON - South Kona
- 26 HUA - Hualalai
- 27 KOH - Kohala
- 28 KEA - Mauna Kea
- 29 HIL - Hilo
- 30 DIS - Distant, everywhere else

Table 4 (continued). The latitude and longitude limits of the regions are given below. If the coordinates overlap, precedence is given as in the maps.

No.	Code	N. Lat.	S. Lat.	W. Lon.	E. Lon.
1	SNC	19 28.0	19 24.5	155 19.0	155 14.0
2	SSC	19 24.5	19 22.0	155 19.0	155 16.5
3	SEC	19 24.5	19 22.0	155 16.5	155 14.0
4	SER	19 26.0	19 20.5	155 14.0	155 07.2
5	SME	19 26.0	—	155 07.2	155 00.0
6	KOA	19 22.0	19 20.5	155 17.0	155 14.0
7	SSF	—	19 10.0	155 17.0	155 00.0
8	SLE	19 32.0	19 16.0	155 00.0	154 40.0
9	SF1	19 22.0	19 10.0	155 17.0	155 14.5
10	SF2	19 26.0	19 10.0	155 14.5	155 12.3
11	SF3	19 26.0	19 10.0	155 12.3	155 09.1
12	SF4	19 26.0	19 10.0	155 09.1	155 05.3
13	SF5	19 26.0	19 10.0	155 05.3	155 00.0
14	LER	19 32.0	19 16.0	155 00.0	154 40.0
15	MLO	19 35.0	19 19.0	155 35.0	155 19.0
16	LSW	19 19.0	18 40.0	155 43.0	155 25.0
17	GLN	19 35.0	19 26.0	155 19.0	155 00.0
18	SWR	19 22.0	19 10.0	155 25.0	155 17.0
19	INT	19 28.0	19 22.0	155 19.0	155 14.0
20	KAO	19 30.0	19 19.0	155 32.0	155 19.0
21	DEP	19 35.0	19 10.0	155 25.0	155 00.0
22	DLS	19 19.0	18 40.0	155 43.0	155 25.0
23	DML	19 35.0	19 19.0	155 35.0	155 19.0
24	LOI	19 10.0	18 40.0	155 25.0	155 00.0
25	KON	19 39.0	19 00.0	156 20.0	155 43.0
26	HUA	19 55.0	19 39.0	156 20.0	155 43.0
27	KOH	20 25.0	19 55.0	156 20.0	155 34.0
28	KEA	20 25.0	19 35.0	155 34.0	154 40.0
29	HIL	19 47.0	19 32.0	155 09.0	154 40.0

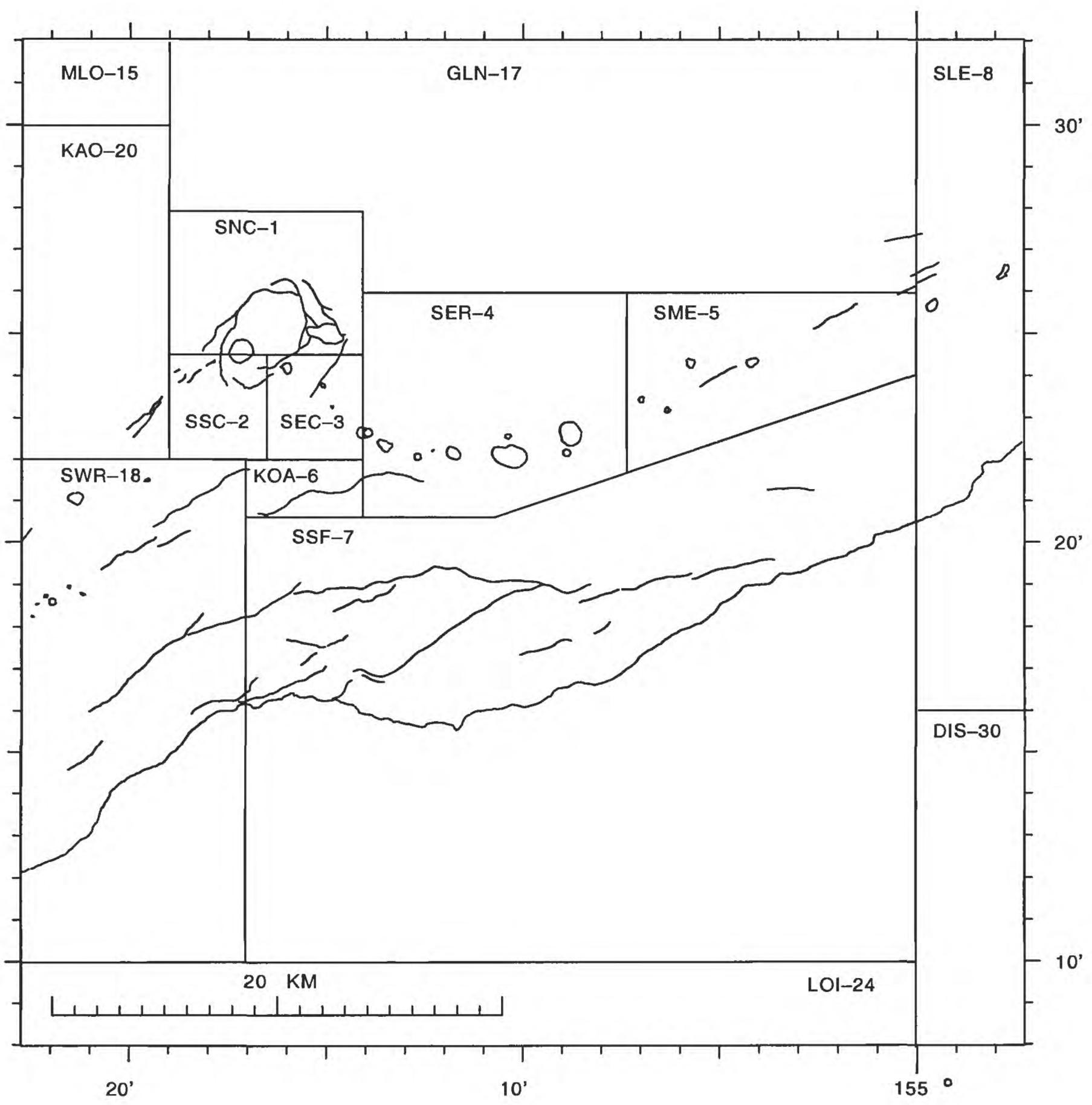


Figure 6. Earthquake classification, shallow (0-5 km deep), for Kilauea and the east flank of Mauna Loa.

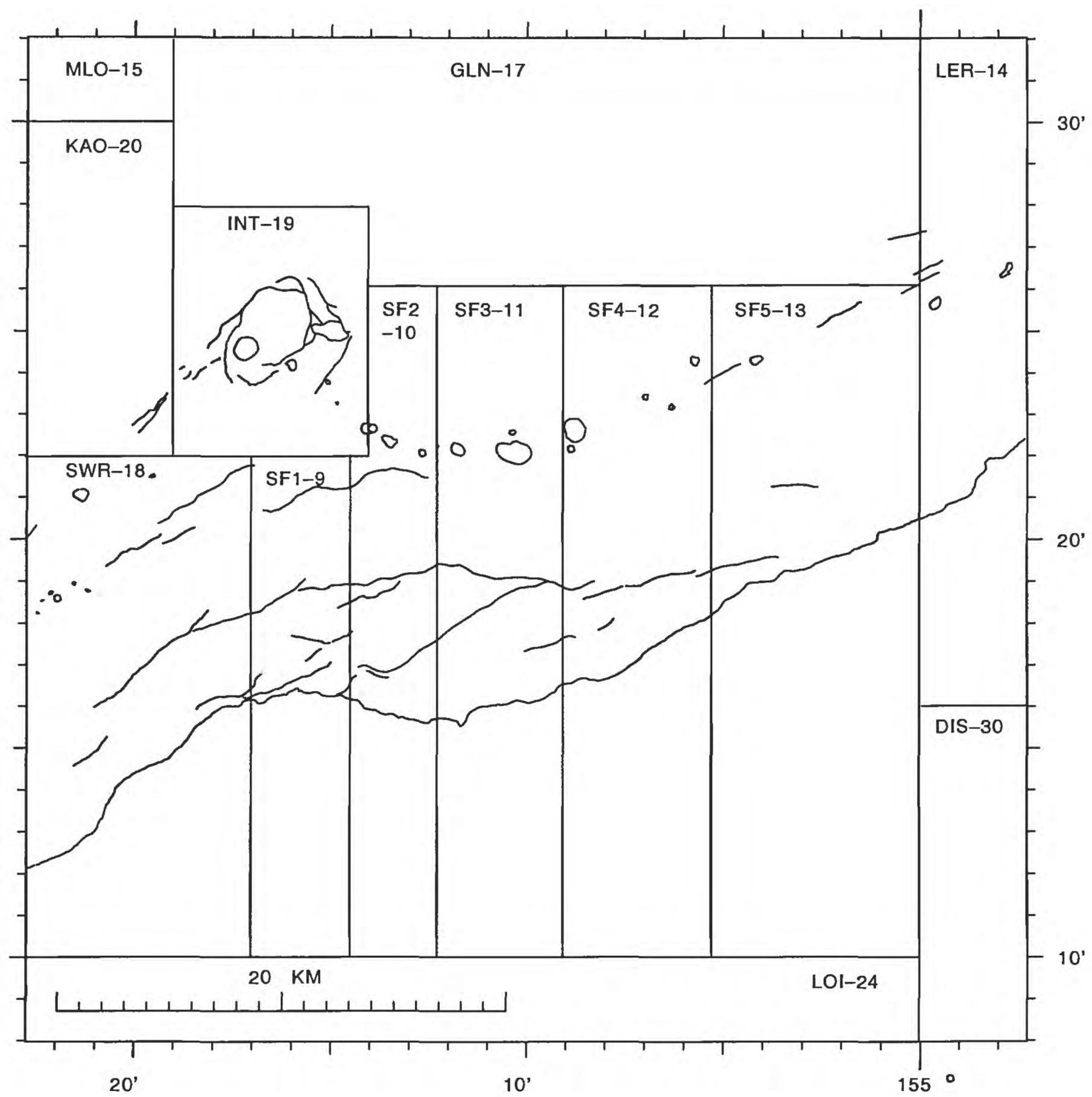


Figure 7. Earthquake classification, intermediate (5.1-13 km deep), for Kilauea and the east flank of Mauna Loa.

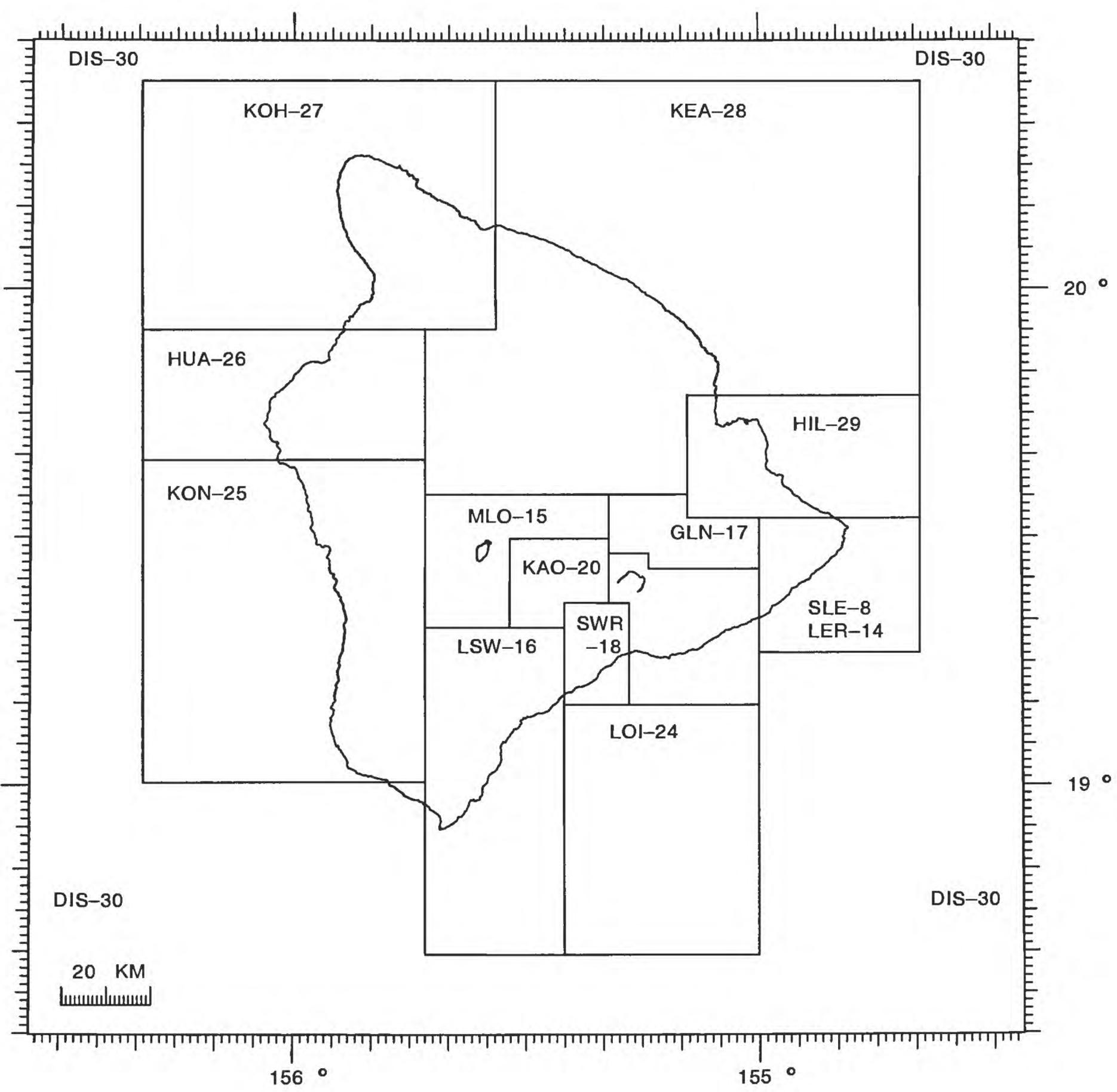


Figure 8. Earthquake classification, crustal (0-13 km deep), for the Island of Hawai'i.

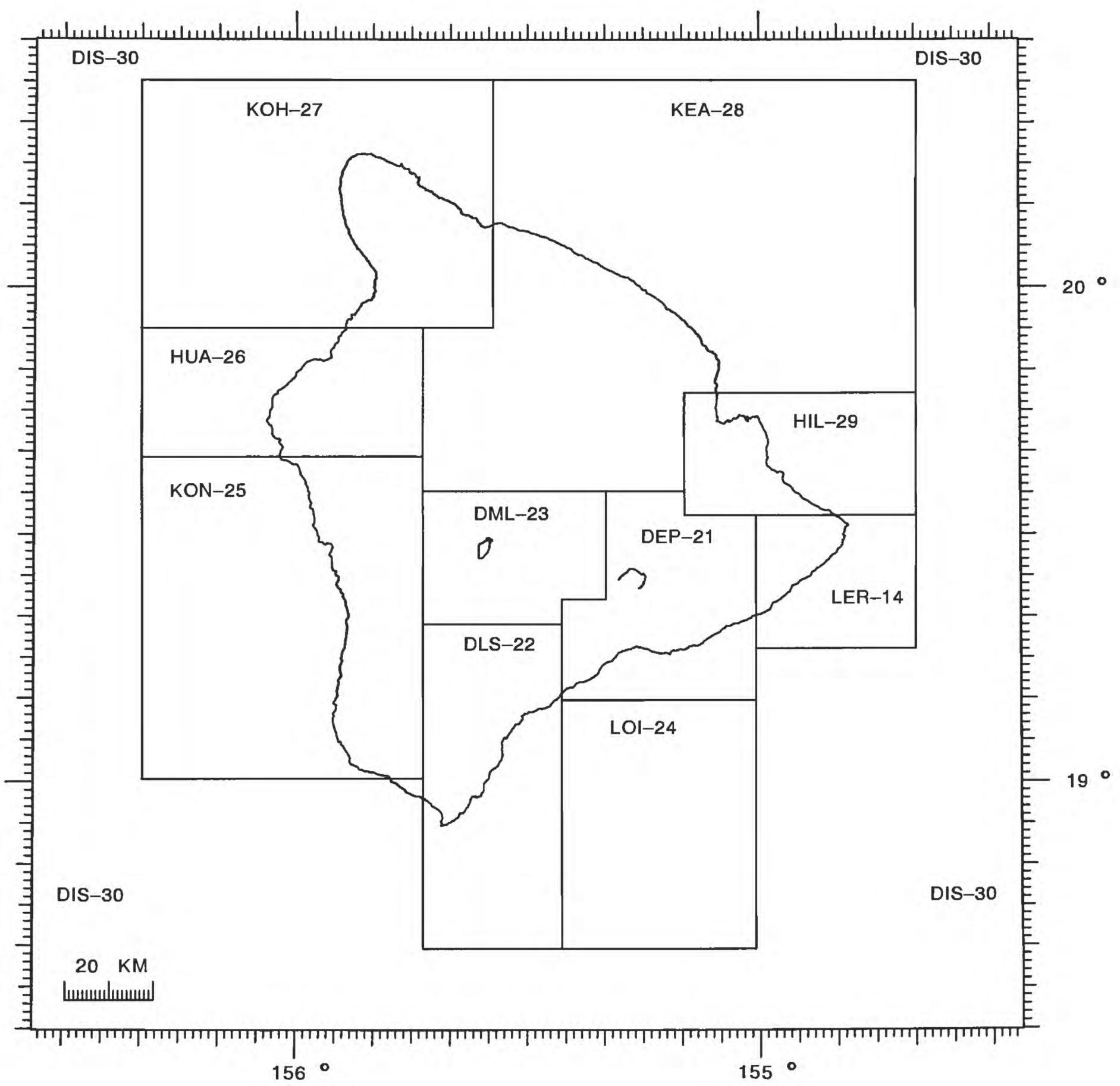


Figure 9. Earthquake classification, deep (greater than 13 km deep), for the Island of Hawai'i.

Figure 10. 1996 earthquake locations, Hawaiian Islands,
0–60 km depth, $M \geq 3.5$.

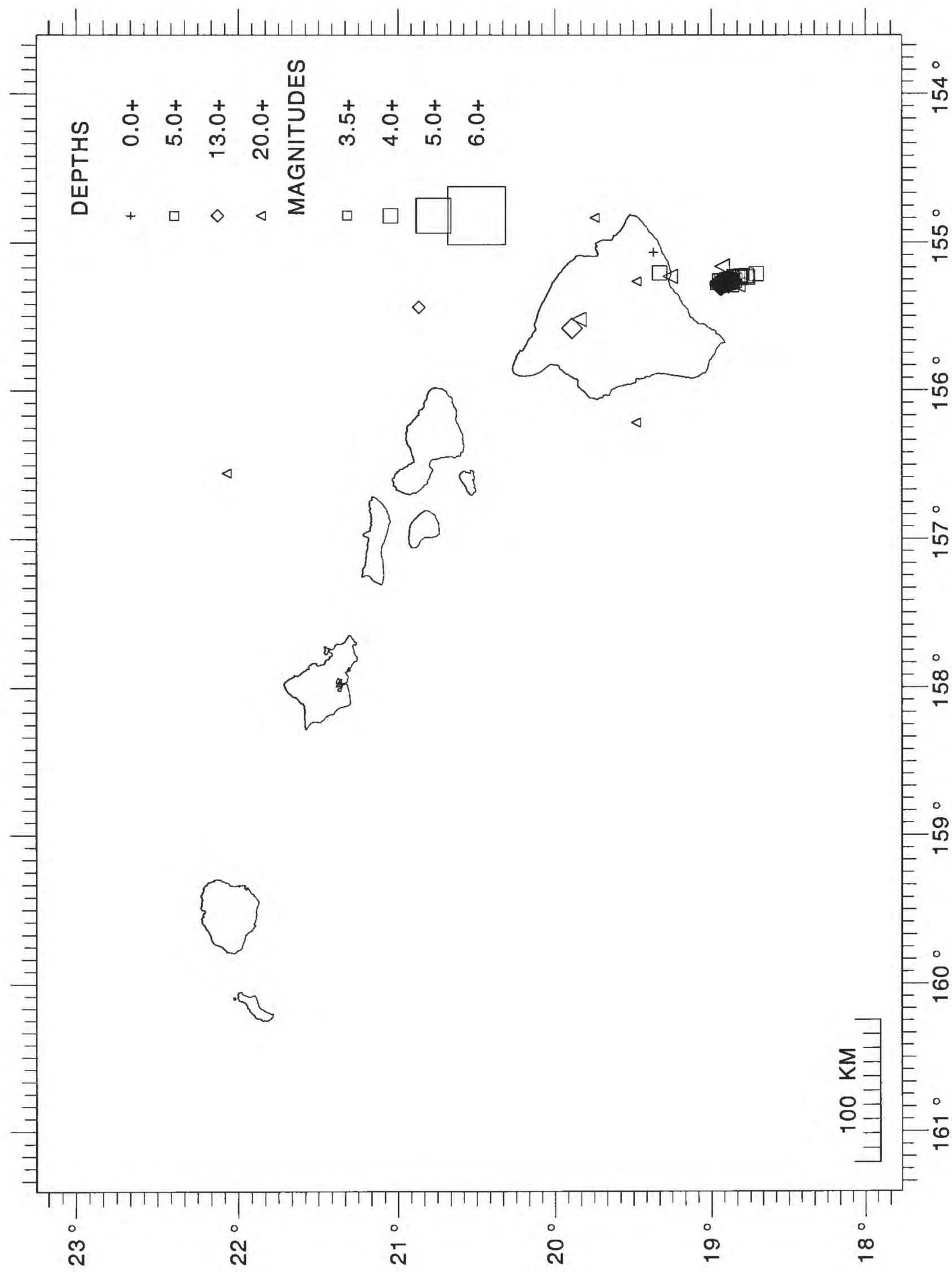


Figure 11. 1996 earthquake locations, Hawai'i Island,
0–60 km depth, $M \geq 3.0$.

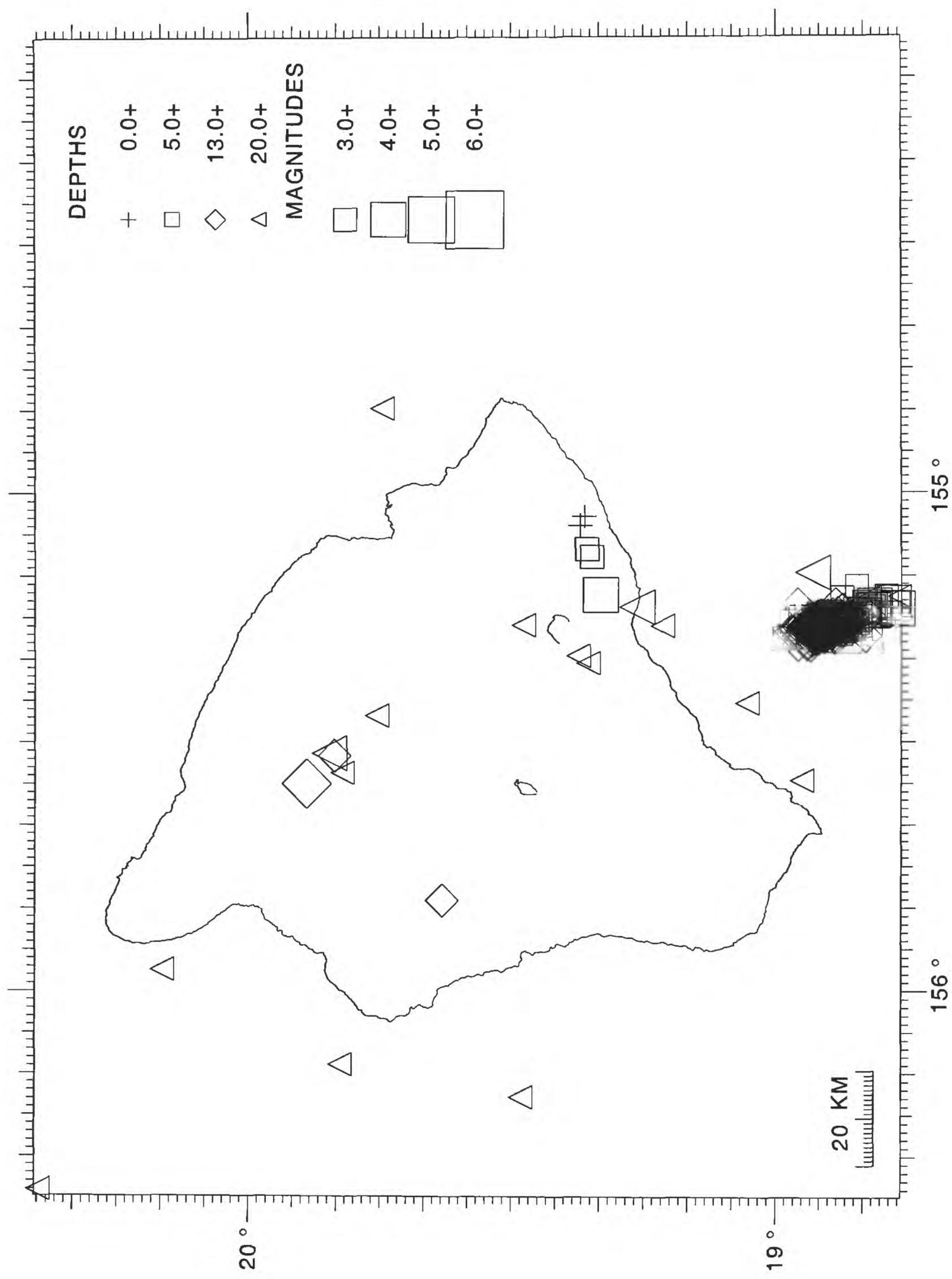


Figure 12. 1996 earthquake locations, Hawai'i Island, shallow (0–5.0 km depth), $M \geq 2.0$.

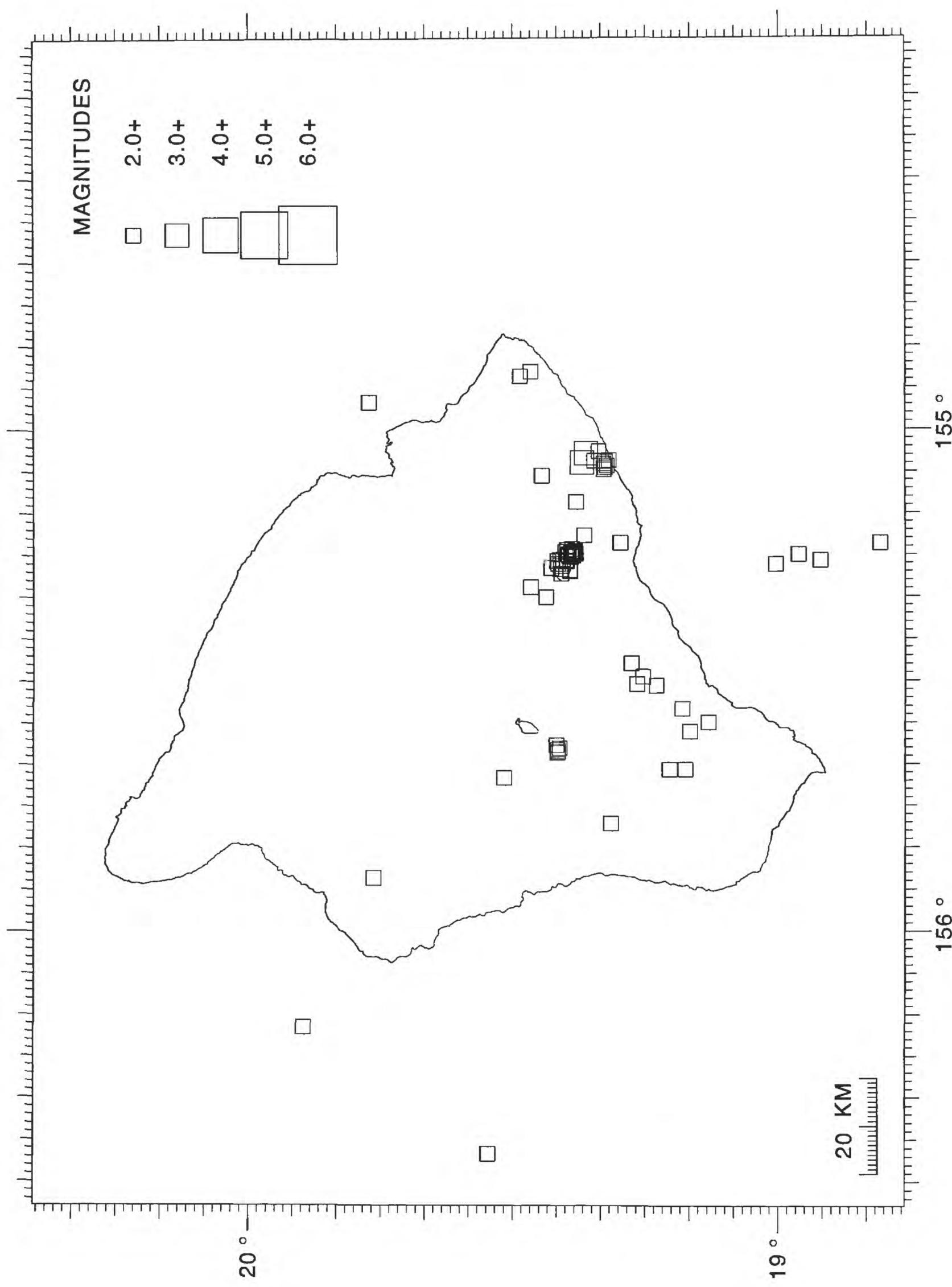


Figure 13. 1996 earthquake locations, Hawai'i Island, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

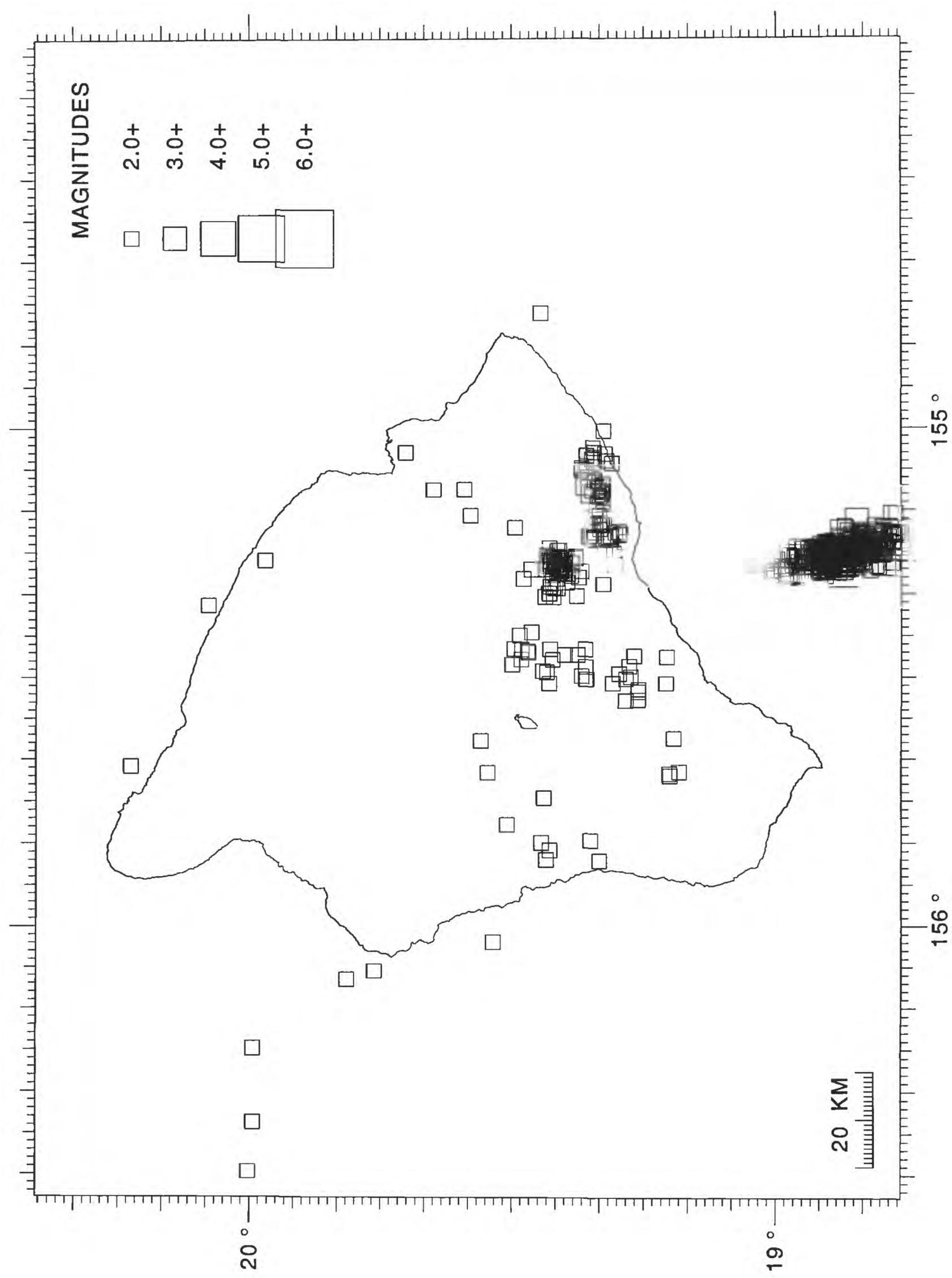


Figure 14. 1996 earthquake locations, Hawai'i Island, deep (13.1–60.0 km depth), $M >= 2.0$.

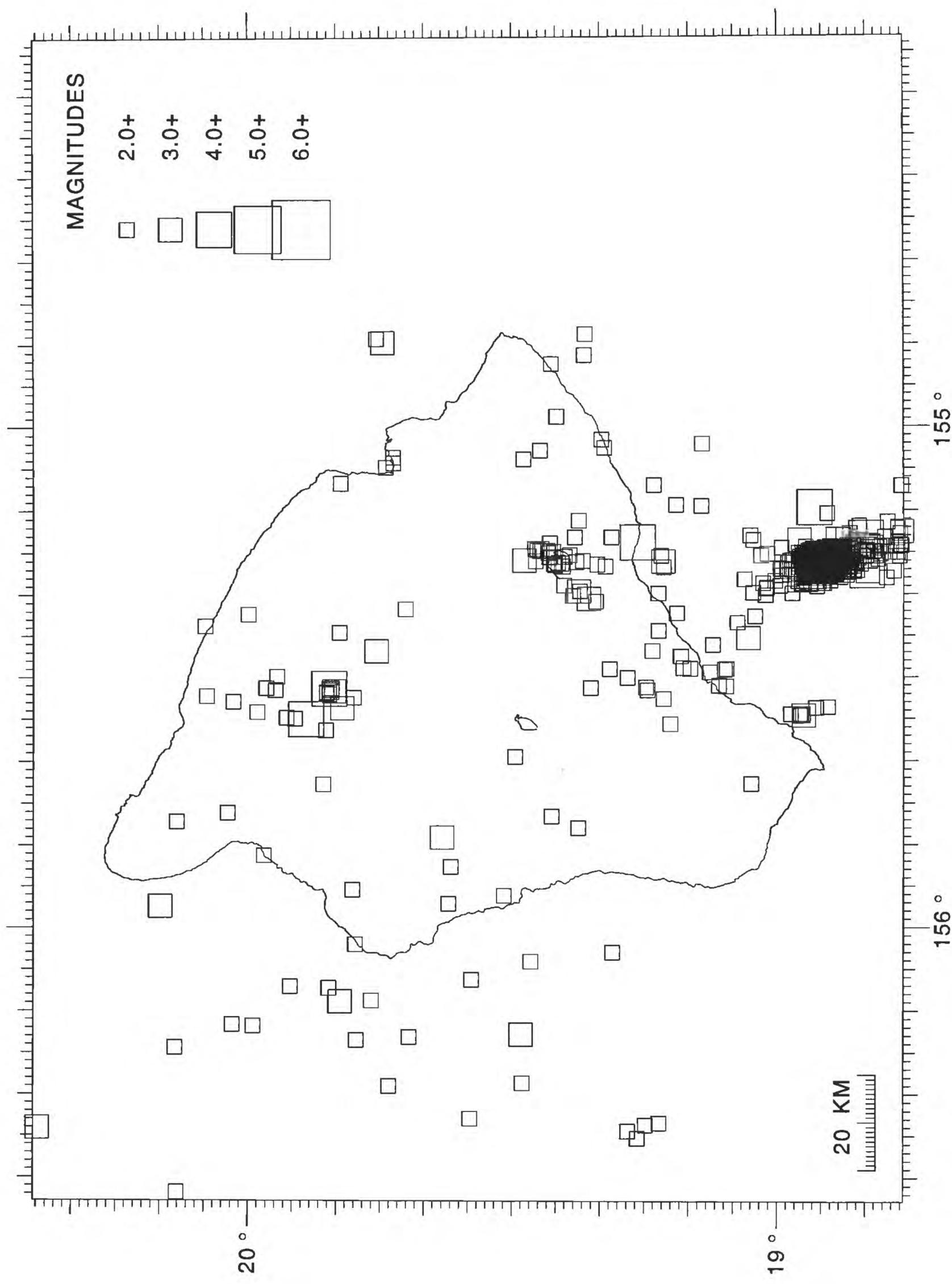


Figure 15. 1996 earthquake locations, Kilauea summit,
shallow (0–5.0 km depth), $M \geq 1.0$.

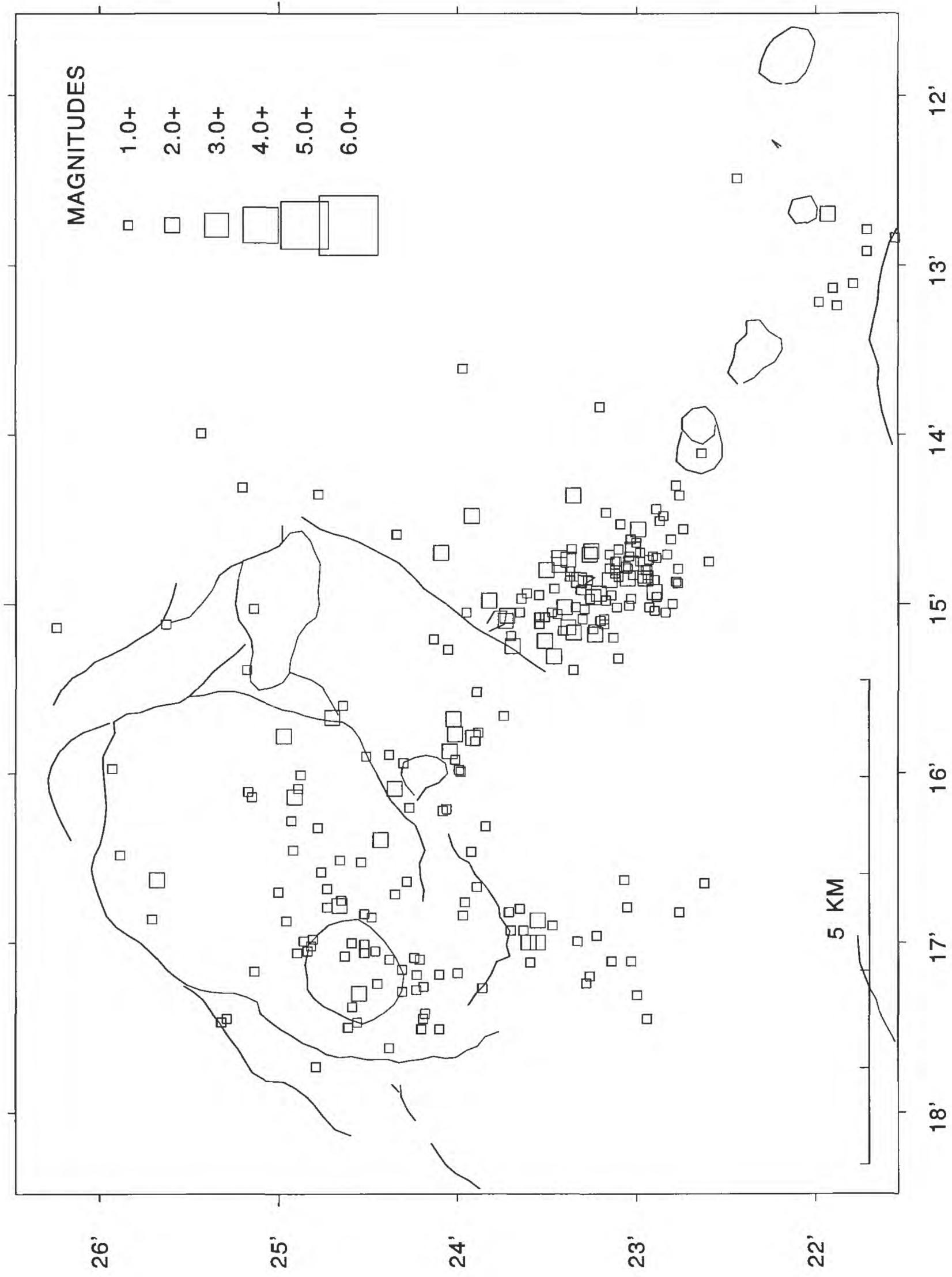


Figure 16. 1996 earthquake locations, Kilauea summit,
intermediate (5.1–13.0 km depth), $M \geq 1.0$.

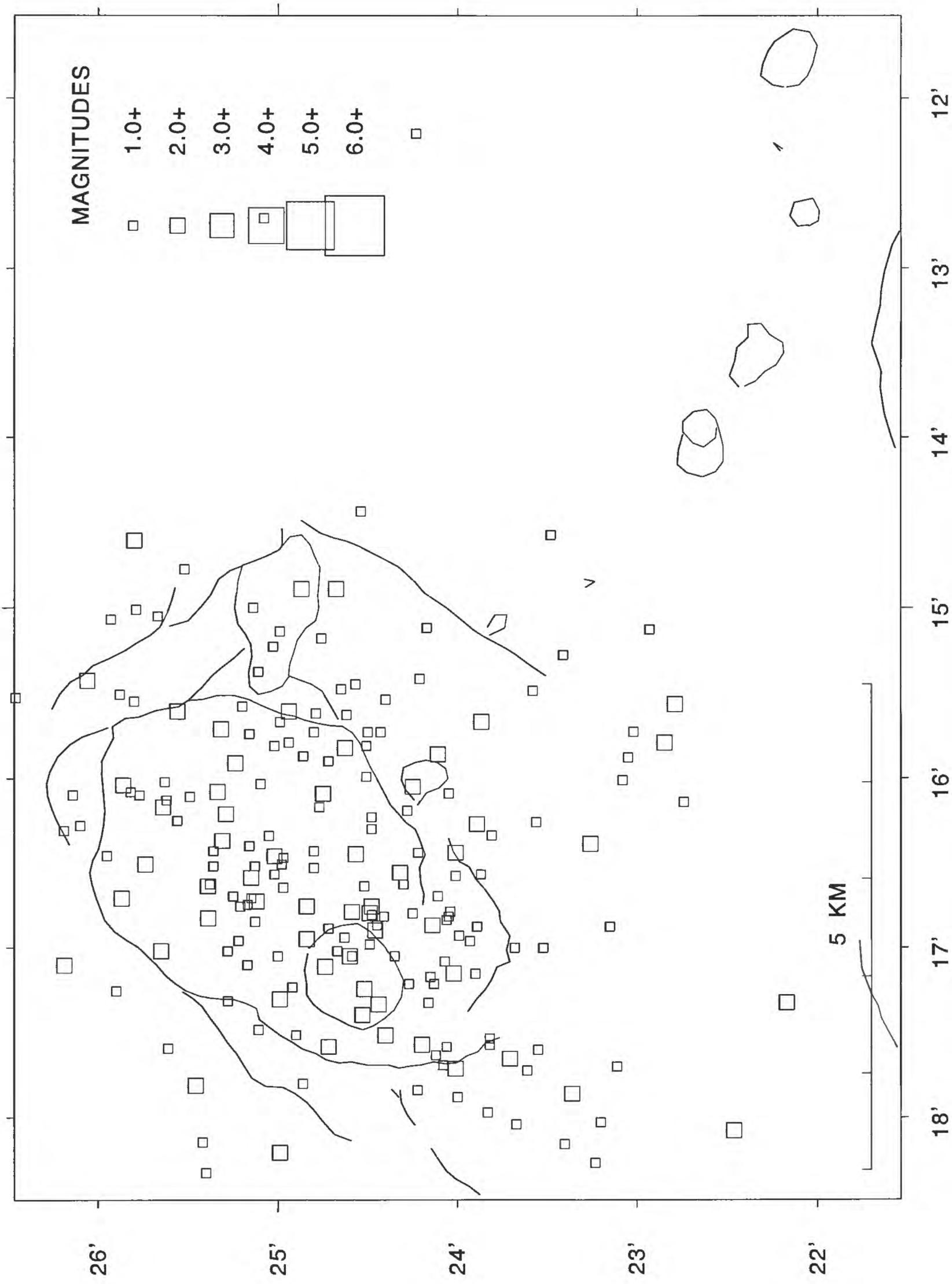


Figure 17. 1996 earthquake locations, Kilauea summit,
deep (13.1–60.0 km depth), $M \geq 1.0$.

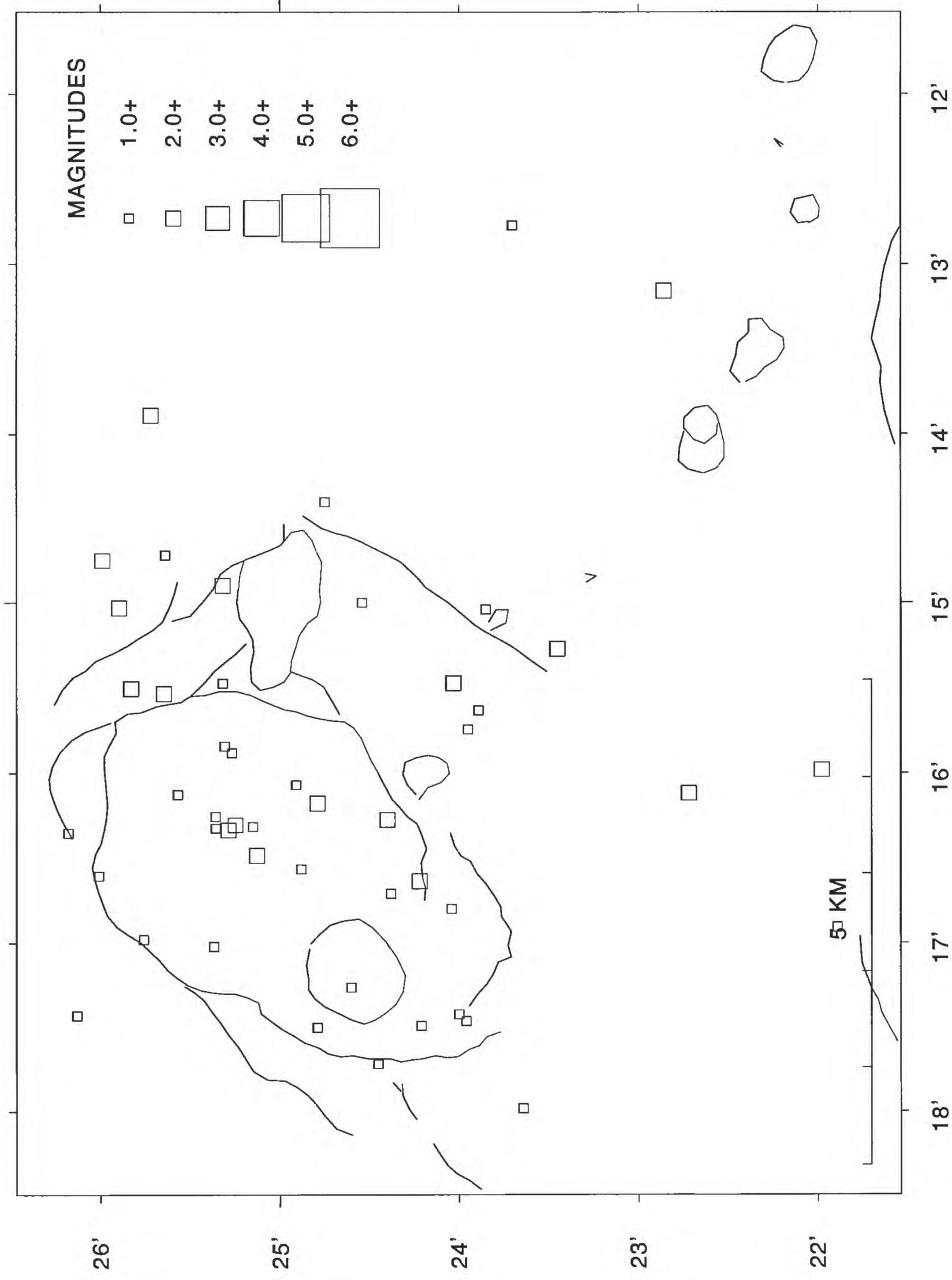


Figure 18. 1996 earthquake locations, Kilauea south flank,
shallow (0–5.0 km depth), $M \geq 2.0$.

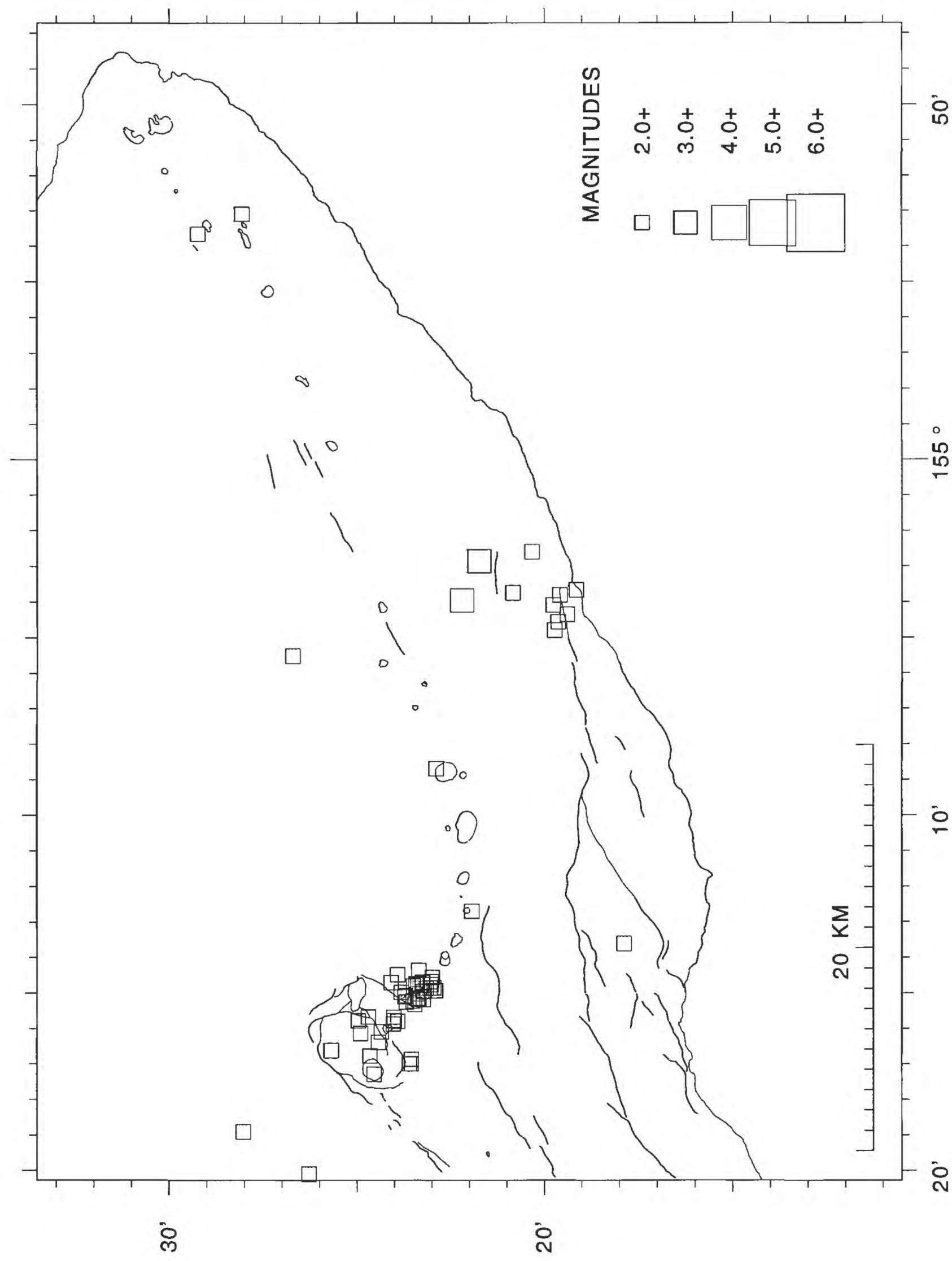


Figure 19. 1996 earthquake locations, Kilauea south flank, intermediate (5.1–13.0 km depth), $M \geq 2.0$.

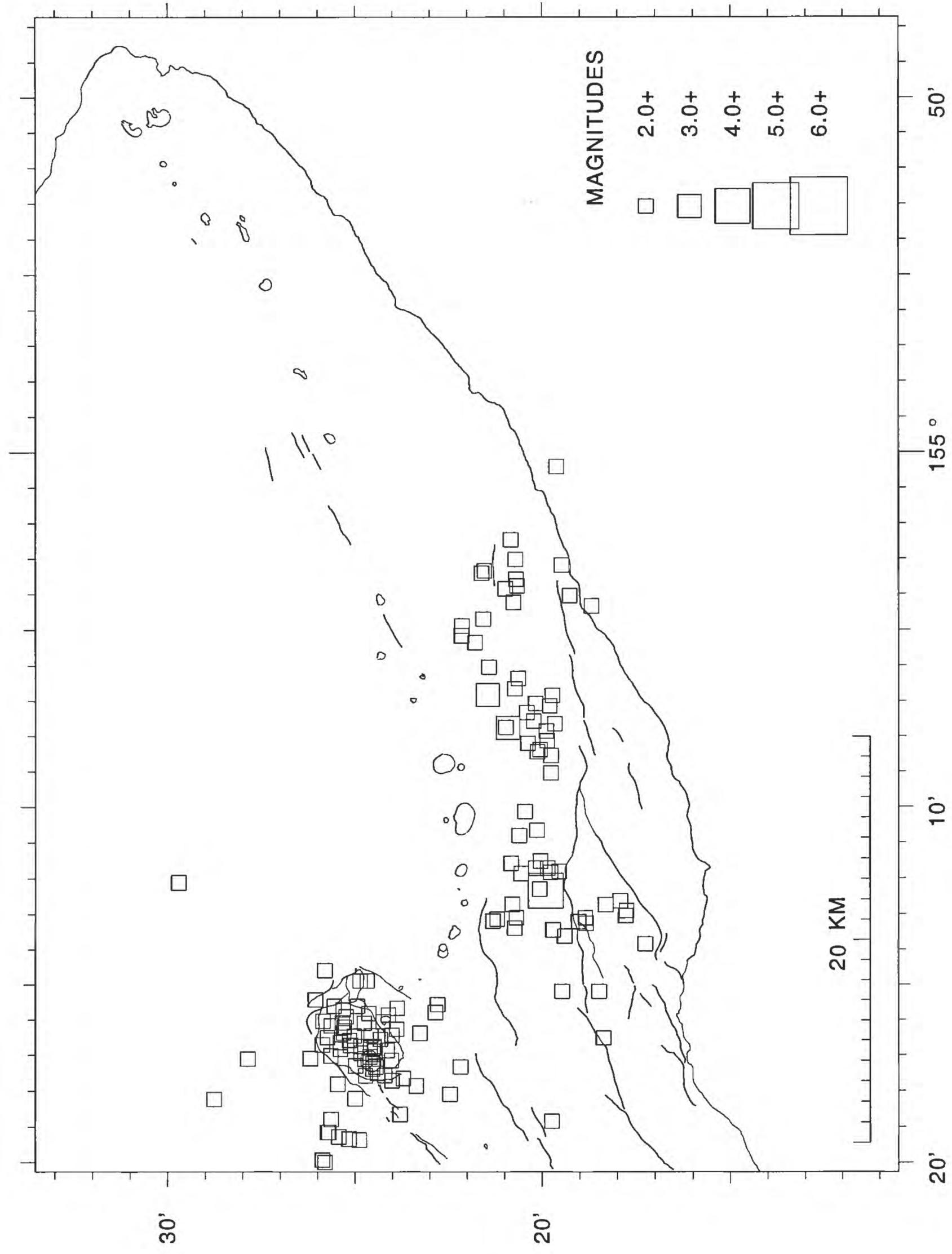


Figure 20. 1996 earthquake locations, Kilauea south flank, deep (13.1–60.0 km depth), $M \geq 2.0$.

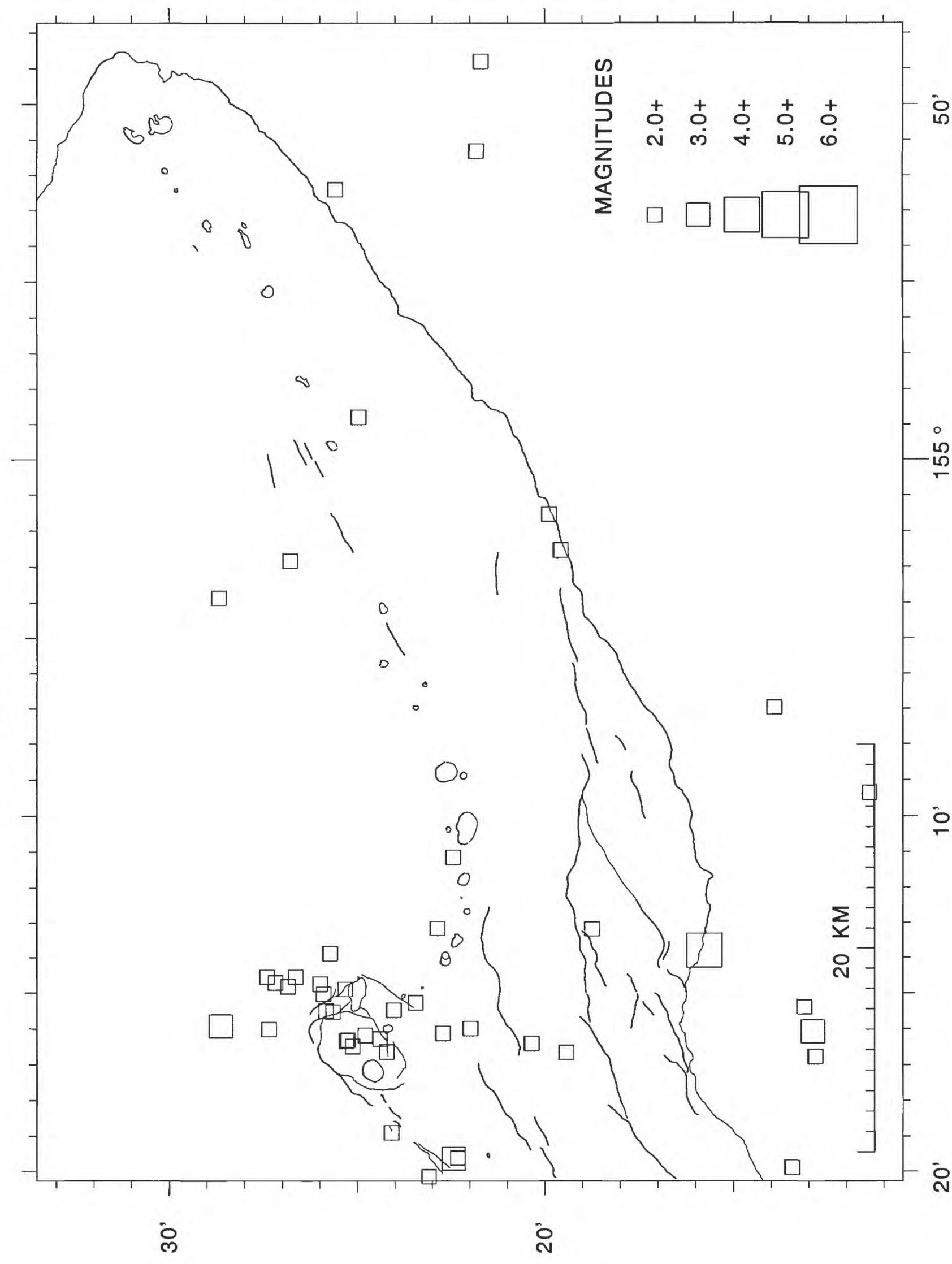


Figure 21. 1996 earthquake locations, Mauna Loa summit,
shallow (0–5.0 km depth), $M \geq 2.0$.

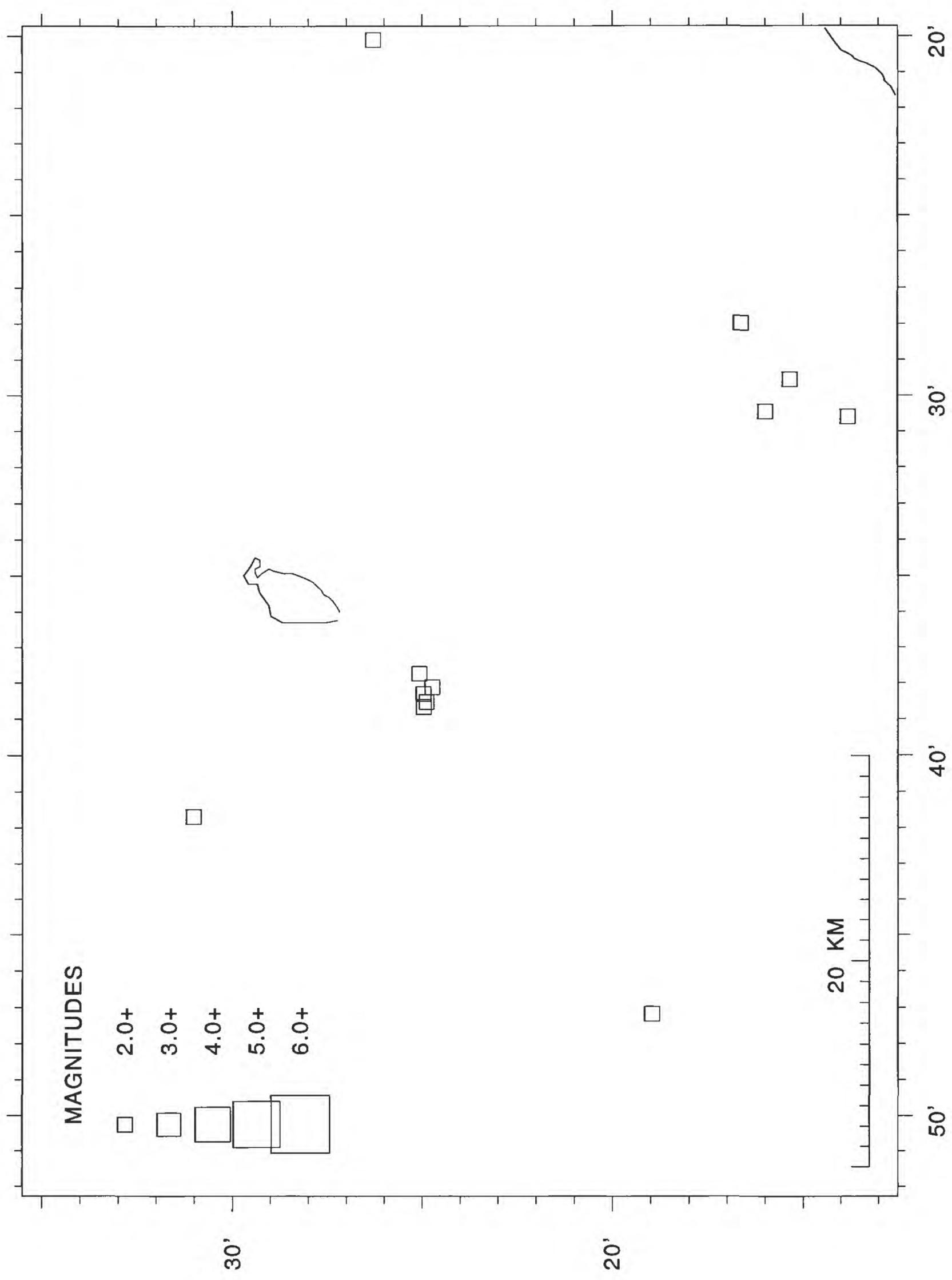


Figure 22. 1996 earthquake locations, Mauna Loa summit,
intermediate (5.1–13.0 km depth), $M_g \geq 2.0$.

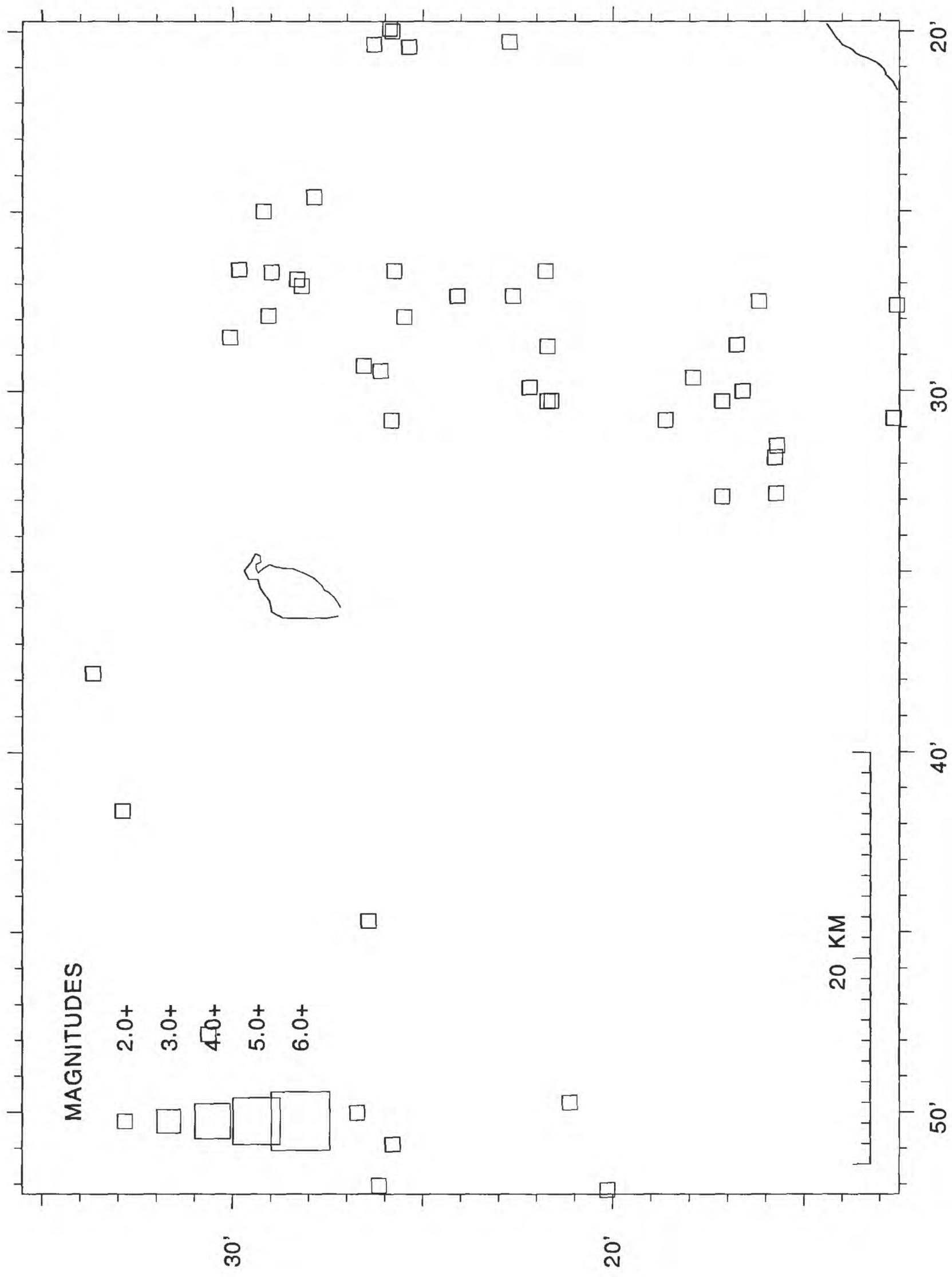


Figure 23. 1996 earthquake locations, Mauna Loa summit,
deep (13.1–60.0 km depth), $M \geq 2.0$.

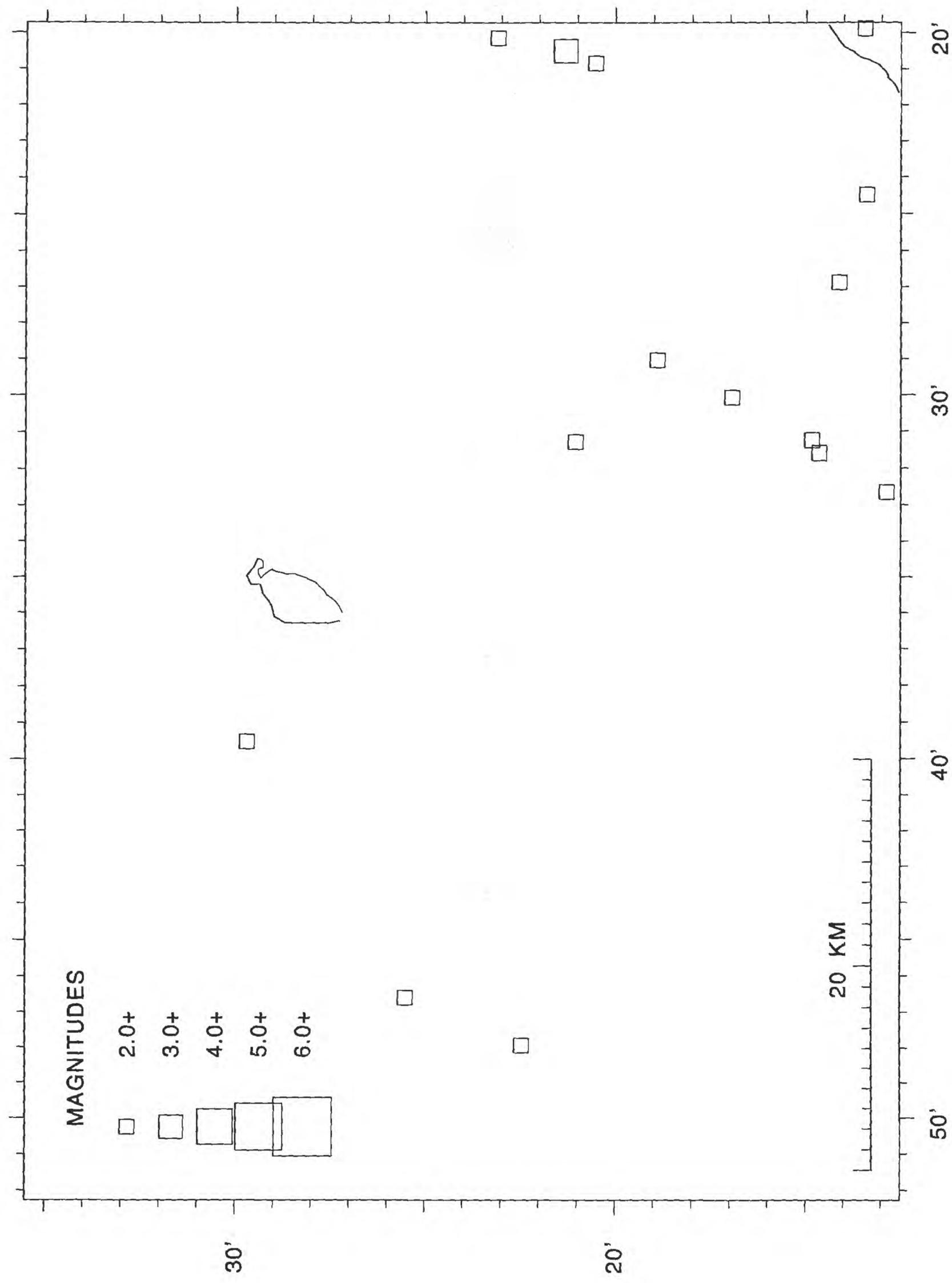


Table 5 is a chronological list of selected events successfully located during 1996. For each event, the following data are presented:

ORIGIN TIME - in Hawaiian Standard Time: date, hour (HR), minute(MN), and second (SEC).

EPICENTER - in degrees and minutes of north latitude (LAT N) and west longitude (LON W) in Old Hawaiian Datum.

DEPTH - Depth of focus in kilometers.

NRD - Number of P & S readings with final weights > 0.1.

NS - Number of S. readings with final weights > 0.1

RMS SEC - Root mean square travel time residuals, in seconds.

ERH km - Standard error of the epicenter, in kilometers.

ERZ km - Standard error of depth of focus, in kilometers.

LOC REMKS - Remarks, three-letter code for geographic location of events.

See Figures 6-9 for location of mnemonic code. Additional one-letter codes have the following meanings:

F felt

L long-period character

T associated with harmonic tremor

B quarry or other blast

* the location program had a convergence problem, which usually means that the depth may be unreliable.

- the depth was held fixed.

PREF MAG - The preferred magnitude chosen from the available magnitudes.

Preference set as: X-amplitude magnitude, if none

D-Develocorder duration magnitude, if none

U-external magnitude, usually calculated from drum records.

NRD - The total weight of amplitude magnitude readings from contributing stations.

AZ GAP - Largest azimuthal gap in degrees between azimuthally adjacent stations.

MIN DS - Distance to the nearest station, in kilometers.

Table 6 is a list of events of magnitude 3.0 or greater, selected from Table 5.

YR	MON	SEC	LAT N	LONG W	DEPTH	N	RMS	ERH	ERZ	LOC	PREF	N	AZ	MIN	
			KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	S	SEC	
96	MAY	5	2337	48.21	19	15.36	155	15.40	0.95	4313	.11	.6	.3	SSE	
96	MAY	6	100	11.51	19	25.38	155	30.72	12.03	34.5	.11	.3	.8	KAO	
96	MAY	6	1929	7.30	19	12.93	155	10.40	9.76	22	.5	.09	1.0	1.1	SF3
96	MAY	6	2112	33.42	19	20.46	155	2.16	0.29	30	.7	.12	1.2	.3	SSE
96	MAY	6	2201	36.05	19	16.72	155	30.66	0.01	41	.9	.18	.4	.3	LSW #
96	MAY	7	55	43.32	20	9.70	156	33.36	23.44	4511	.09	1.1	4.5	DIS	
96	MAY	9	924	7.34	19	20.58	155	11.47	6.79	3812	.12	.4	.7	SF3	
96	MAY	9	933	16.94	19	20.84	155	11.36	9.21	30	.6	.07	.4	.6	SF3
96	MAY	9	1747	52.48	19	19.15	155	3.67	0.23	15	.5	.08	.7	.3	SSEFB
96	MAY	10	1302	7.52	19	20.11	155	8.23	7.63	28	.7	.08	.4	.8	SF4
96	MAY	10	1550	9.83	19	13.12	155	15.39	33.29	5617	.11	.7	.8	DEP	
96	MAY	11	642	37.66	19	28.63	155	28.33	11.30	4310	.12	.4	.8	KAO	
96	MAY	11	833	5.23	19	16.52	155	12.54	9.62	38	.6	.12	.4	.7	SF2
96	MAY	11	905	15.29	19	58.24	155	51.28	34.27	32	.5	.08	1.3	2.0	KOH
96	MAY	11	2102	40.50	19	20.05	155	11.89	7.81	32	.3	.09	.5	.7	SF3
96	MAY	11	2301	54.77	19	21.06	155	6.68	7.69	44	.9	.11	.5	.6	SF4
96	MAY	12	3	32.42	19	18.24	155	12.91	9.15	4411	.13	.4	.6	SF2	
96	MAY	12	153	21.59	19	16.74	155	13.65	7.19	29	.2	.11	.6	1.0	SF2
96	MAY	12	1130	58.90	19	15.38	155	13.04	10.91	21	.6	.12	.9	1.0	SF2
96	MAY	12	1237	24.93	19	17.20	155	13.13	9.03	35	.5	.12	.5	.9	SF2
96	MAY	12	1734	34.31	19	21.92	155	8.76	3.89	25	.4	.07	.4	.4	SER
96	MAY	12	1741	8.69	19	21.27	155	15.42	1.38	29	.9	.09	.2	.3	KOA
96	MAY	12	1759	35.23	19	19.12	155	13.88	9.53	33	.2	.08	.5	.6	SF2
96	MAY	12	1902	19.68	19	25.02	155	38.60	2.88	24	.6	.12	.3	.4	MLO
96	MAY	12	2209	27.68	19	19.47	155	8.46	7.01	40	.6	.10	.4	.6	SF4
96	MAY	12	2235	20.82	19	17.15	155	13.02	4.29	17	.2	.06	.6	.7	SSE
96	MAY	13	25	0.19	19	26.64	155	14.55	32.11	5819	.11	.5	.5	DEP	
96	MAY	13	1013	39.69	19	20.36	155	16.40	33.52	5315	.12	.6	.5	DEP	
96	MAY	13	1024	27.34	19	53.99	155	24.20	28.55	42	.9	.10	.8	.9	KEA
96	MAY	13	1100	34.74	19	21.12	155	4.44	6.89	38	.7	.15	.6	.8	SF5
96	MAY	13	1549	35.38	19	16.59	155	13.00	10.71	3810	.11	.5	.9	SF2	
96	MAY	13	1550	16.72	19	16.64	155	13.21	10.86	4210	.11	.5	.8	SF2	
96	MAY	13	1552	5.58	19	16.93	155	13.08	11.77	32	.5	.11	.6	.6	SF2
96	MAY	13	1620	15.97	19	16.37	155	12.98	10.84	33	.9	.09	.5	.7	SF2
96	MAY	13	2027	38.65	19	16.87	155	13.67	9.75	4814	.12	.4	.6	.7	SF2
96	MAY	13	2037	53.14	19	17.15	155	12.97	10.88	33	.6	.11	.5	.6	SF2
96	MAY	15	2021	50.96	19	7.12	155	37.56	5.31	34	.1	.14	.5	2.1	LSW
96	MAY	16	459	4.60	19	26.71	155	50.01	10.76	5014	.16	.5	.3	KON	
96	MAY	17	127	1.16	20	9.95	155	57.40	29.27	5314	.11	.8	2.7	KOH	
96	MAY	17	230	15.07	19	50.73	155	31.33	20.71	32	.5	.10	.8	1.3	KEA

YR	MON	DA	HRMN	SEC	LAT N			LON W			DEPTH N			N RMS			ERH ERZ LOC			PREF N AZ MIN																					
					DEG	MIN	DEG	MIN	RD	S	SEC	KM	RD	S	SEC	KM	RD	GAP	MAG	RD	GAP	DS																			
96	SEP	19	506	26.55	19	19.39	155	3.35	7.52	30	1	.15	1.0	.8	SFSE	1.6X	1	198	9	96	SEP	30	1125	11.32	19	19.25	155	13.12	7.08	34	4	.09	.4	.8	SF2	1.3X	4	78	4		
96	SEP	19	726	13.72	19	22.66	155	9.12	3.20	24	4	.09	.5	.3	SER	1.9X	2	118	2	96	SEP	30	1418	30.70	19	26.57	155	34.22	57.92	16	3	.07	1.8	1.4	DMLL	1.6X	2	53	3		
96	SEP	19	911	13.29	19	24.48	155	16.23	10.47	18	5	.14	.8	.8	INTL	2.0X	3	90	1	96	OCT	1	650	6.03	19	29.68	155	39.52	50.46	3210	.11	1.0	.7	DML	2.1X	4	137	6			
96	SEP	19	1006	16.94	19	19.37	155	10.20	7.20	32	6	.10	.4	.6	SP3	1.6X	4	100	5	96	OCT	2	105	55.93	20	0.15	156	29	64	12.31	36	7	.10	6.8	9.9	DIS	-	2.1X	5	313	77
96	SEP	19	1420	33.62	19	23.27	155	14.86	2.73	15	6	.09	.3	.5	SEC	1.7X	3	104	2	96	OCT	2	435	34.78	19	28.99	155	38.41	21.13	28	8	.11	.6	.8	DML	1.8X	3	121	4		
96	SEP	19	1750	16.68	19	19.47	155	15.20	8.59	33	5	.11	.4	.6	SF1	2.2X	3	124	4	96	OCT	2	1911	19.53	19	25.37	155	20.68	1.99	19	5	.09	.3	.8	KAO	1.5X	4	89	4		
96	SEP	19	1805	7.88	19	30.67	154	48.38	10.33	19	4	.10	.2	.6	LER	1.5X	2	322	4	96	OCT	3	852	13.88	19	25.85	155	19.27	7.35	22	5	.14	.6	1.0	KAO	1.6X	4	88	3		
96	SEP	19	1924	25.53	19	24.52	155	16.64	11.83	25	3	.12	.6	.7	INTL	1.7X	3	98	1	96	OCT	3	910	11.72	19	29.19	155	38.05	15.69	17	4	.13	1.5	.6	DML	1.8X	1	208	4		
96	SEP	19	2105	5.25	18	47.51	155	14.42	9.24	28	7	.12	.9	1.0	LOI	1.7X	2	285	47	96	OCT	3	1002	26.89	19	20.32	155	12.91	7.90	28	5	.09	.4	.8	SF2	1.5X	3	68	4		
96	SEP	19	2123	7.90	19	25.95	155	16.46	6.88	20	3	.10	.6	.5	INTL	1.7X	3	113	2	96	OCT	3	2157	3.36	19	24.63	155	17.08	1.86	15	4	.10	.4	.2	SNCL	1.6X	3	77	1		
96	SEP	20	154	58.23	20	2.27	155	46.14	27.24	39	6	.10	1.4	2.0	KOH	2.2X	4	279	39	96	OCT	4	1344	48.66	19	20.51	155	20.85	29.01	4812	.11	.6	.8	DEP	2.1X	8	67	4			
96	SEP	20	714	3.30	19	20.48	155	24.75	10.02	23	4	.09	.5	.9	SWR	1.3X	2	68	3	96	OCT	5	1953	10.55	19	29.82	155	27.05	6.00	25	5	.09	.3	1.0	KAO	1.4X	3	76	4		
96	SEP	20	810	9.12	19	17.65	155	30.18	10.54	24	5	.12	.4	1.1	LSW	1.3X	2	77	10	96	OCT	5	2313	13.36	19	21.70	154	48.80	42.16	5418	.12	1.0	.7	LER	2.6X	9	263	16			
96	SEP	21	414	31.37	18	53.41	155	16.38	16.19	32	.09	2.714	.6	LOT	-	3.0X	3	251	36	96	OCT	6	520	36.64	19	25.20	155	38.85	2.75	23	5	.11	.6	.4	MLO	1.7X	2	183	2		
96	SEP	21	535	44.49	19	19.77	155	13.60	8.55	36	6	.11	.4	.7	SF2	1.6X	6	63	5	96	OCT	6	617	24.39	19	10.23	155	31.35	0.79	36	5	.13	.4	.5	LSW	1.7X	4	114	6		
96	SEP	21	748	12.25	20	19.48	155	54.05	7.47	27	6	.12	7	1.8	9	KOH	-	1.9X	3	316	76	96	OCT	6	651	41.98	19	12.75	155	44.36	9.54	23	.14	1.0	.9	KON	1.6X	4	181	7	
96	SEP	21	1248	26.62	18	46.49	155	14.33	48.42	34	2	.09	1.9	2.3	LOT	2.4X	1	271	49	96	OCT	6	713	24.40	19	10.73	155	5.61	52.81	4811	.11	.8	1.0	DEP	2.0X	7	215	13			
96	SEP	21	1641	23.31	19	45.77	155	34.69	14.48	35	7	.14	.7	.4	KEA	1.6X	4	166	13	96	OCT	6	1648	24.05	19	20.98	155	7.79	7.88	38	8	.09	.4	.6	SF4	1.4X	6	122	4		
96	SEP	21	1901	28.85	19	12.14	155	12.14	27	28	.5	.84	43	8	.11	.3	1.2	LSW	1.7X	6	119	5	96	OCT	6	1723	17.36	19	18.97	155	47.18	0.21	4311	.15	.6	.3	KON	2.1X	9	180	13
96	SEP	21	1906	23.57	19	12.22	155	27.43	5.83	38	3	.12	.4	1.1	LSW	1.5X	5	115	5	96	OCT	6	2147	36.91	19	24.65	155	16.75	1.57	21	6	.10	.3	.2	SNCL	1.8X	5	88	1		
96	SEP	22	327	34.50	19	24.50	155	15.73	8.46	20	5	.10	.8	.6	INTL	1.7X	4	97	2	96	OCT	7	1320	18.90	19	22.11	155	2.68	7.47	4110	.13	.6	.6	SFS	1.7X	6	172	9			
96	SEP	22	1036	33.28	19	32.36	155	55.58	10.45	31	6	.18	1.2	.5	KON	1.5X	4	231	17	96	OCT	7	1532	57.26	19	20.60	155	10.80	8.84	33	6	.10	.4	.6	SF3	2.2X	3	76	3		
96	SEP	22	1714	11.51	19	20.70	155	3.58	9.34	4511	.10	.6	.4	.SF5	2.4X	7	179	9	96	OCT	7	2215	55.41	19	1																

YR	MON	SEC	LAT N			LON W			DEPTH N			N RMS			ERH ERZ LOC			PREF N			AZ MIN																								
			DEG	MIN	SEC	DEG	MIN	SEC	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	S	SEC																					
96	OCT	11	309	19	58	19	11	.08	155	41	.59	.8	35	29	.3	.14	.5	.9	LSW	2.0X	2	122	8	96	OCT	24	2238	7.91	19	20	.60	155	7.41	7.56	36	4	.12	.6	.7	SF4	1.5X	3	131	5	
96	OCT	13	351	55	.33	19	29	.79	155	31	.22	23	.06	37	.8	.10	.4	.8	DML	1.5X	7	65	7	96	OCT	25	130	49.96	19	22	.44	155	12.49	3.69	33	6	.14	.4	.4	SER	1.9X	6	108	1	
96	OCT	13	747	21	.31	19	14	.65	155	31	.60	33	.79	5217	.08	.5	.9	DLS	2.2X	9	62	10	96	OCT	25	138	23.45	19	21	.71	155	12.79	2.63	14	2	.07	.5	.5	SER	1.5X	2	103	2		
96	OCT	13	839	43	.09	19	19	.29	155	13	.58	8	84	29	.5	.07	.4	.6	SF2	1.5X	6	135	6	96	OCT	25	417	44.18	19	25	.39	155	16.83	6.94	23	5	.11	.4	.5	INTL	2.1X	5	103	1	
96	OCT	13	1054	29	.42	19	8	.31	155	57	.72	43	.87	32	.7	.08	1.4	1.1	KON	2.0X	4	253	21	96	OCT	25	2141	53.48	19	23	.64	155	14.97	3.86	22	8	.10	.4	.5	SEC	1.6X	4	93	2	
96	OCT	13	1854	29	.93	19	21	.98	155	15	.98	26	.08	4714	.11	.6	.6	DEP	2.0X	8	92	1	96	OCT	25	2142	30.74	19	23	.34	155	15.02	3.20	22	8	.12	.3	.4	SEC	1.5X	5	102	2		
96	OCT	15	1146	28	.72	19	27	.28	155	26	.00	6	0.3	30	.6	.12	.3	1.6	KAO	1.4X	6	63	7	96	OCT	25	2142	59.04	19	23	.69	155	15.25	3.58	4210	.09	.3	.3	.3	SECF	2.2X	5	74	2	
96	OCT	15	1147	55	.56	19	12	.42	155	42	.16	0	0.6	39	.7	.19	.5	.3	LSW	#	1.8X	6	117	9	96	OCT	25	2149	46.94	19	23	.30	155	14.86	2.13	17	6	.09	.2	.3	SEC	1.6X	5	102	2
96	OCT	15	2048	45	.48	19	20	.96	155	7	.75	9	53	4412	.10	.5	.4	SEAF	2.9X	7	122	4	96	OCT	25	2150	55.97	19	24	.09	155	14.70	2.62	27	4	.10	.3	.4	SECF	2.1X	5	123	3		
96	OCT	16	9	13.70	19	19	.73	155	6	.84	8	65	37	.6	.11	.6	.4	SF4	2.2X	4	150	5	96	OCT	25	2152	13.23	19	23	.41	155	15.16	3.04	22	8	.08	.3	.3	SEC	1.8X	4	101	2		
96	OCT	16	541	33	.61	19	20	.57	155	.94	.8	7	80	32	.4	.12	.6	.7	SF4	1.7X	4	102	3	96	OCT	25	2152	25.54	19	23	.11	155	15.02	2.19	21	8	.13	.2	.4	SEC	1.8X	4	109	2	
96	OCT	16	614	29	.89	19	20	.54	155	.89	.8	0.4	4513	.09	.4	.5	SF4	1.9X	8	106	3	96	OCT	25	2152	57.01	19	23	.46	155	14.91	1.86	18	7	.10	.2	.4	SEC	1.5X	2	98	2			
96	OCT	16	732	56	.75	19	15	.72	155	31	.51	10	39	35	.5	.19	.5	1.4	LSW	2.1X	2	56	10	96	OCT	25	2153	42.44	19	23	.20	155	15.10	2.80	19	8	.11	.3	.4	SEC	1.9X	4	106	2	
96	OCT	16	1151	55	.86	19	25	.05	155	37	.89	2	77	25	.5	.12	.3	.3	MLO	1.9X	3	131	1	96	OCT	25	2155	19.27	19	23	.73	155	15.10	3.42	4011	.12	.3	.3	.3	SECF	2.5X	6	77	2	
96	OCT	16	1243	57	.43	19	21	.83	155	26	.46	11	94	28	.4	.10	.4	.9	KAO	1.3X	2	74	2	96	OCT	25	2157	40.69	19	23	.72	155	15.07	3.63	3811	.12	.3	.3	.3	SECF	2.3X	5	91	2	
96	OCT	16	2045	12	.91	19	20	.11	155	6	.73	.8	0.2	35	.8	.11	.5	.5	SF4	1.8X	3	148	6	96	OCT	25	2159	14.81	19	23	.14	155	14.95	2.65	20	7	.13	.3	.4	SEC	1.6X	4	108	2	
96	OCT	16	2212	20	.43	19	16	.77	155	28	.73	10	.77	4612	.12	.3	.6	LSWF	3.0X	6	55	9	96	OCT	25	2211	51.43	19	22	.93	155	14.74	3.50	19	8	.10	.3	.4	SEC	1.4X	4	116	2		
96	OCT	17	541	12	.90	19	17	.55	155	13	.03	8	25	25	.5	.09	.5	.9	SF2	1.8X	4	172	9	96	OCT	25	2212	44.14	19	23	.29	155	15.03	2.95	19	8	.11	.3	.4	SEC	1.1X	5	103	2	
96	OCT	17	918	35	.95	19	17	.08	155	21	.07	5	54	29	.1	.13	.5	2.6	LSW	1.2X	4	61	7	96	OCT	25	2218	27.47	19	23	.35	155	14.84	3.00	19	6	.09	.3	.4	SEC	1.6X	4	82	3	
96	OCT	17	1109	55	.61	19	20	.00	155	8	.02	6	80	26	.5	.09	.7	.8	SF4	1.8X	3	173	5	96	OCT	25	2221	0.14	19	23	.31	155	14.92	2.52	19	8	.09	.3	.4	SEC	1.7X	4	103	2	
96	OCT	17	1134	31	.38	19	7	.90	155	34	.97	0	0.3	19	.3	.26	4	.0	LSW	#	2.3X	1	260	13	96	OCT	26	32	33.38	19	23	.35	155	14.36	2.49	30	6	.11	.3	.3	SEC	2.1X	5	96	2
96	OCT	18	442	50	.93	19	19	.96	155	46	.68	11	.27	33	.6	.12	.8	.5																											

YR	MON	DA	HRMN	SEC	LAT N		LON W		DEPTH N		N RMS		ERH ERZ		LOC		PREF N	AZ MIN	YR	MON	DA	HRMN	SEC	LAT N		LON W		DEPTH N		N RMS		ERH ERZ		LOC		PREF N	AZ MIN			
					DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	GAP	DS						DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	RD	GAP	DS			
96	OCT	29	22	42.04	19	23.92	155	14.48	2.93	22	3	.13	.3	.3	SECL	2.1X	4	.80	1	96	NOV	4	2142	5.33	19	25.24	155	15.91	11.77	25	5	.10	.5	.5	INTL	2.2X	3	.99	2	
96	OCT	29	155	57.29	19	25.13	155	16.85	7.13	18	3	.10	.6	.6	INTL	1.9X	4	.97	0	96	NOV	4	2257	51.27	19	25.36	155	16.43	8.55	16	5	.08	.8	.8	INTL	1.8X	4	163	1	
96	OCT	29	518	33.04	19	23.36	155	17.86	8.80	25	4	.11	.5	.6	INTL	2.1X	4	.58	2	96	NOV	5	33	53.62	19	24.97	155	15.78	4.62	35	6	.13	.4	.5	SNCL	2.0X	4	98	2	
96	OCT	29	654	55.42	19	25.29	155	16.21	10.42	26	4	.12	.6	.5	INTL	2.1X	3	113	2	96	NOV	5	242	7.54	19	24.20	155	17.57	8.16	24	6	.12	.5	.7	INTL	2.1X	4	44	2	
96	OCT	29	937	37.11	19	25.86	155	16.04	9.46	21	5	.11	.6	.6	INTL	2.1X	5	124	2	96	NOV	5	520	49.44	19	18.77	155	16.14	8.07	33	4	.11	.4	.9	SF1	1.4X	5	131	3	
96	OCT	29	1034	34.98	20	7.91	156	35.73	29.68	5216	.11	1.4	2.7	DIF	3.2X	8	319	93	96	NOV	5	606	37.83	19	19.58	155	7.93	7.80	30	4	.11	.7	.9	SF4	1.5X	3	178	4		
96	OCT	29	1146	47.73	19	23.33	155	16.96	10.24	20	5	.12	.9	.6	INTL	1.9X	3	92	1	96	NOV	5	805	57.39	19	23.89	155	16.27	10.07	23	6	.09	.5	.4	INTL	2.0X	4	100	1	
96	OCT	29	1320	37.54	19	24.46	155	16.90	9.44	24	6	.10	.5	.6	INTL	2.0X	4	81	1	96	NOV	5	1122	17.31	19	21.31	155	29.76	10.10	40	9	.09	.3	.7	KAO	1.7X	6	57	4	
96	OCT	29	1503	3.37	19	24.63	155	15.32	11.42	20	5	.10	.8	.6	INTL	2.1X	3	101	2	96	NOV	5	1830	53.94	19	24.57	155	16.45	9.91	28	8	.13	.5	.5	INTL	2.1X	6	89	1	
96	OCT	29	1630	8.50	19	18.83	155	13.36	9.90	28	3	.09	.6	.8	SF2	1.4X	3	155	7	96	NOV	5	2208	48.49	19	24.22	155	17.84	10.97	20	6	.11	.6	.7	INTL	1.8X	5	77	2	
96	OCT	29	1940	40.83	19	25.12	155	16.73	10.58	24	6	.12	.5	.5	INTL	2.1X	5	100	1	96	NOV	6	125	58.22	19	23.68	155	17.00	10.09	22	6	.12	.5	.5	INTL	2.0X	5	69	1	
96	OCT	29	2230	21.75	19	24.17	155	15.12	12.19	18	3	.10	.1	.9	INTL	1.7X	4	77	2	96	NOV	6	1039	41.63	19	25.32	155	15.71	12.52	11	2	.10	1.3	1.4	INTL	2.2X	2	136	2	
96	OCT	30	224	40.01	19	24.90	155	17.51	9.32	24	6	.11	.5	.6	INTL	1.9X	4	75	1	96	NOV	6	1101	27.74	19	29.83	155	27.37	7.91	32	6	.11	.3	.9	KAO	1.7X	4	75	4	
96	OCT	30	321	44.64	19	19.38	155	12.99	9.28	33	5	.10	.4	.8	SF2	1.5X	5	124	6	96	NOV	6	1239	16.85	19	20.14	155	12.29	8.62	35	5	.13	.5	.4	SF3	2.0X	3	127	5	
96	OCT	30	1320	39.74	19	24.94	155	15.61	7.47	25	5	.14	.7	.6	INTL	2.0X	4	121	2	96	NOV	6	1707	32.76	19	23.89	155	15.63	16.12	9	3	.11	2.7	1.4	DEPL	2.0X	1	133	2	
96	OCT	30	1438	32.73	19	24.98	155	16.51	10.22	12	3	.06	1	.0	9	INTL	1.7X	3	154	1	96	NOV	6	2315	42.95	19	24.53	155	17.39	8.23	13	3	.11	.9	.8	INTL	2.1X	3	81	1
96	OCT	30	1625	41.69	19	24.22	155	16.44	11.86	17	4	.09	.8	.7	INTL	1.8X	5	115	1	96	NOV	7	434	34.05	19	23.61	155	17.72	6.18	14	2	.14	.7	1.2	INTL	2.0X	3	82	2	
96	OCT	30	1655	38.94	19	25.61	155	19.37	6.05	20	6	.06	.4	.8	KAO	1.7X	4	81	3	96	NOV	7	445	25.31	19	22.85	155	15.79	10.11	13	5	.10	1.3	.8	INTL	2.1X	2	156	1	
96	OCT	30	1733	59.92	19	21.99	155	15.42	6.79	34	4	.11	.6	.7	SF5	1.8X	4	157	4	96	NOV	7	608	4.00	19	24.59	155	17.05	11.76	11	2	.10	1.1	1.5	INTL	1.9X	3	119	1	
96	OCT	30	1852	0.60	19	24.86	155	17.80	11.89	18	5	.13	.7	.9	INTL	1.8X	5	79	1	96	NOV	7	653	32.52	19	20.24	155	5.42	10.02	16	3	.12	1.7	.5	SF4	1.7X	1	254	7	
96	OCT	31	706	0.97	19	27.11	155	29.64	12.68	35	6	.11	.3	.8	KAO	1.5X	7	46	7	96	NOV	7	958	20.17	19	26.06	155	15.43	11.30	26	6	.13	.8	.5	INTL	2.1X	5	161	3	
96	OCT	31	1934	48.48	19	18.62	156	2.99	46.20	42																														

YR	MON	HRMN	SEC	LAT N			LON W			DEPTH N			N RMS			ERH ERZ			LOC			PREF	N	AZ	MIN	RD	GAP	DS											
				DEG	MIN	SEC	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	S	SEC	KM	RD	GAP														
96	NOV	10	1902	30.34	19	24.44	155	17.33	8.99	28	8	.12	.4	.6	INTL	2.3X	6	51	1	96	NOV	17	2234	6.58	19	24.79	155	17.50	13.17	.08	.8	1.2	DEPL	1.7X	2	82	1		
96	NOV	10	2122	8.11	19	17.25	155	13.51	10.19	31	3	.09	.6	.8	SET2	1.5X	5	153	9	96	NOV	17	2349	40.25	19	20.06	155	11.54	8.14	4011	.14	.4	.7	SEF3	1.9X	8	108	5	
96	NOV	11	609	58.51	19	25.19	155	19.95	3.36	33	9	.08	.3	.6	KAO	1.5X	5	66	4	96	NOV	18	47	4.89	19	23.28	155	17.24	1.73	22.5	.12	.3	.3	SSCL	1.8X	5	59	2	
96	NOV	11	629	29.71	19	28.03	155	18.90	1.84	4815	.11	.3	.3	.3	GLNF	2.7X	5	114	3	96	NOV	18	314	25.86	19	25.17	155	39.37	2.65	19.5	.09	.6	.4	MLO	1.7X	1	208	3	
96	NOV	11	659	48.36	19	25.49	155	19.43	5.98	3810	.10	.3	.7	.7	KAO	2.0X	6	77	3	96	NOV	18	519	52.76	19	25.49	155	16.11	9.60	16.3	.15	1.1	.8	INTL	1.8X	2	128	2	
96	NOV	11	1105	43.69	19	25.50	155	19.34	6.74	33	7	.11	.4	.8	KAO	1.8X	4	49	3	96	NOV	18	723	54.70	19	11.42	155	16.14	50.93	29.5	.11	1.3	1.6	DEPL	1.7X	3	232	13	
96	NOV	11	2126	37.32	19	23.26	155	16.39	11.36	23	6	.11	.7	.6	INTL	2.2X	4	57	1	96	NOV	18	816	17.35	19	25.17	155	16.75	10.45	20.5	.09	.6	.7	INTL	1.8X	3	101	1	
96	NOV	12	202	24.57	19	20.84	155	11.60	10.00	34	7	.12	.5	.5	SEF3	1.4X	5	112	4	96	NOV	18	1114	10.37	19	24.80	155	16.43	12.06	13.2	.13	1.1	1.5	INTL	1.8X	1	97	1	
96	NOV	12	257	26.68	19	26.56	155	29.30	10.59	4512	.11	.3	.8	.8	KAO	2.0X	8	45	8	96	NOV	18	1137	56.41	19	19.89	155	7.33	8.44	26.3	.09	.8	.6	SEF4	1.9X	2	198	5	
96	NOV	12	1818	46.28	19	24.62	155	15.63	13.00	13	4	.08	1.6	1.0	DEPL	1.8X	2	204	2	96	NOV	18	1656	37.98	19	22.86	155	28.43	10.78	33.2	.10	.4	.7	KAO	1.6X	3	49	2	
96	NOV	12	1819	7.33	19	21.93	155	8.94	3.45	17	4	.08	.5	.4	SER	1.8X	2	127	2	96	NOV	18	1723	8.97	19	25.38	155	16.63	12.69	10.3	.07	1.3	1.0	INTL	1.7X	1	108	1	
96	NOV	12	1935	20.53	19	26.74	155	23.38	10.35	31	5	.11	.4	.8	KAO	1.7X	3	70	5	96	NOV	18	2014	10.57	19	24.35	155	17.05	7.21	23	.3	.15	.5	INTL	1.6X	4	77	1	
96	NOV	12	2331	0.94	19	33.80	155	41.88	10.52	29	4	.11	.5	.9	MLO	1.8X	2	93	9	96	NOV	18	2333	52.18	19	18.49	155	13.05	9.89	34.5	.10	.5	.7	SEF2	1.6X	4	135	8	
96	NOV	13	50	19.16	19	25.00	155	17.05	11.86	16	4	.07	.8	.9	INTL	1.6X	2	90	0	96	NOV	18	2341	24.30	19	26.18	155	16.36	14.57	14.2	.12	1.1	1.4	DEPL	1.8X	2	133	3	
96	NOV	13	643	6.99	19	19.65	155	7.57	9.23	16	6	.04	.6	1.0	SEF4	1.8X	3	191	4	96	NOV	19	231	19.54	19	24.97	155	16.47	11.58	24.5	.10	.5	.6	INTL	1.8X	5	102	1	
96	NOV	13	1337	57.52	19	20.76	155	4.23	8.13	3	.10	.6	.6	.6	SEF5	2.1X	2	173	8	96	NOV	19	419	32.45	19	25.02	155	16.57	10.64	16.2	.10	.6	.7	INTL	1.8X	3	101	1	
96	NOV	13	1340	9.52	19	20.86	155	4.38	7.60	27	2	.10	.7	.6	SEF5	1.9X	2	169	7	96	NOV	19	845	49.47	19	25.28	155	17.02	12.04	11.2	.12	1.5	1.1	DEPL	1.9X	2	96	1	
96	NOV	13	1922	46.38	19	24.15	155	17.17	6.07	25	6	.09	.4	.4	INTL	1.9X	5	67	1	96	NOV	19	1730	31.50	19	23.15	155	16.88	8.19	10.3	.08	1.3	2.0	INTL	1.7X	2	154	1	
96	NOV	14	117	56.63	19	24.21	155	17.49	15.44	10	1	.09	1.2	2.1	DEPL	1.8X	2	85	2	96	NOV	19	1843	24.95	19	25.74	155	16.51	12.95	26	6	.13	.9	INTL	2.3X	5	110	2	
96	NOV	14	332	5.57	19	24.63	155	16.94	12.85	22	4	.11	.7	.8	INTL	1.8X	4	84	1	96	NOV	19	1922	8.64	19	24.40	155	16.28	13.95	26	5	.11	.7	DEPL	2.1X	5	87	1	
96	NOV	14	514	18.52	19	11.24	155	20.57	31	.89	32	4	.11	1.0	1.1	DEP	1.8X	2	194	8	96	NOV	19	2242	43.49	19	24.16	155	17.32	8.69	9.2	.14	1.6	1.6	INTL	1.7X	2	136	1
96	NOV	14	550	42.87	19	24.04	155	16.80	14.22	24	5	.11	.6	.4	DEPL	1.6X	4	73	0	96	NOV	19	2320	11.49	19	24.39	155	16.87	13.06	11.3	.16	2.3	1.7	DEPL	1.9X	2	125	1	
96	NOV	14	601	17.13	19	25.40	155	18.33	6.20	37	9	.11	.4</																										

YR	MON	DA	HRMN	SEC	LAT N	LON W	DEPTH	N	RMS	ERH	ERZ	LOC	PREF	N	AZ	MIN			
					DEG	MIN	KM	RD	S	SEC	KM	REMARKS	MAG	RD	GAP	DS			
96	DEC	18	1745	51.70	19	22.07	155	28.67	10.42	35	4	.11	.4	.8	KAO	1.7X	2	53	2
96	DEC	18	2241	54.95	19	24.80	155	16.53	8.44	30	7	.11	.4	.4	TNTL	1.6X	6	95	1
96	DEC	19	2119	6.99	19	20.46	155	11.40	8.92	36	6	.11	.5	.7	SF3	1.4X	5	103	4
96	DEC	20	11	26.39	19	20.74	155	6.67	6.98	36	4	.12	.6	.6	SF4	1.3X	4	141	5
96	DEC	20	759	4.64	19	24.80	155	15.73	10.36	25	5	.13	.8	.5	TNTL	1.6X	4	104	2
96	DEC	20	1025	6.74	20	4.73	155	21.36	7.00	35	5	.14	1.1	.7	KEA	2.2X	5	281	21
96	DEC	21	712	37.38	19	33.19	155	55.52	10.09	29	4	.13	.9	.4	KON	1.7X	5	218	7
96	DEC	21	1020	35.68	19	17.06	155	30.08	4.95	32	2	.20	.5	3.6	LSW	1.2X	2	79	11
96	DEC	21	1806	18.38	19	27.76	155	25.43	14.92	40	9	.11	.3	.4	DML	1.9X	7	45	5
96	DEC	22	1430	49.09	19	20.21	155	10.69	8.56	28	3	.10	.6	.7	SF3	1.4X	3	117	4
96	DEC	22	1910	24.38	19	21.22	155	13.13	8.56	38	4	.12	.4	.6	SF2	1.5X	4	103	5
96	DEC	24	1230	15.10	19	34.61	156	6.29	29.91	27	6	.10	1.3	1.4	KON	2.3X	3	282	22
96	DEC	25	3	20.15	19	25.62	155	16.13	8.86	18	4	.10	.8	.6	TNTL	2.0X	4	119	2
96	DEC	25	1429	14.22	19	24.81	155	18.75	4.46	34	9	.12	.3	.6	SNC	2.0X	6	66	2
96	DEC	25	1711	31.79	19	28.09	154	52.90	5.29	25	3	.13	1.3	.8	LER	1.5X	3	185	4
96	DEC	25	1825	20.56	19	22.54	155	25.72	12.06	30	3	.10	.4	.7	KAO	1.3X	4	46	3
96	DEC	25	2019	52.10	19	22.72	155	16.12	31.60	4310	.12	.7	.7	.7	DEP	2.3X	6	59	1
96	DEC	25	2341	18.87	19	42.74	156	1.57	5.97	25	3	.19	1.8	.9	HUA	2.0X	3	273	20
96	DEC	26	904	32.63	19	47.88	156	2.04	42.33	38	6	.07	1.4	1.2	HUA	2.6X	4	278	24
96	DEC	26	1411	8.27	19	22.62	155	30.44	9.49	29	4	.08	.4	.8	KAO	1.5X	3	53	5
96	DEC	26	1526	15.20	19	19.97	155	7.26	8.83	35	6	.11	.6	.6	SF4	1.5X	6	137	5
96	DEC	26	1744	19.81	19	19.27	155	8.04	9.22	30	5	.09	.5	.6	SF4	1.5X	4	121	4
96	DEC	27	1609	16.56	19	19.10	155	13.20	8.16	24	4	.12	.5	1.0	SF2	1.4X	5	127	6
96	DEC	27	2059	42.84	19	21.46	155	4.85	7.46	22	2	.11	.7	.9	SF5	1.4X	3	159	6
96	DEC	27	2300	21.64	19	22.93	155	15.02	3.04	18	7	.11	.4	.4	SEC	1.8X	4	116	2
96	DEC	28	1023	2.40	19	19.54	155	9.01	7.95	19	3	.11	.7	1.0	SF4	1.5X	3	137	4
96	DEC	28	1025	30.38	19	19.41	155	9.17	8.07	25	5	.06	.5	.8	SF3	1.7X	5	91	4
96	DEC	30	204	35.72	19	26.82	155	25.86	2.34	6	.04	1.3	5.6	KAO	.6D	1	131	7	
96	DEC	30	2225	15.44	19	19.31	155	15.21	6.59	21	3	.10	.5	1.1	SF1	1.3X	6	126	4
96	DEC	30	2244	13.01	19	20.31	155	13.15	7.18	22	3	.12	.6	.9	SF2	1.4X	3	113	4

Table 6.

YR	MON	DA	HRMN	SEC	LAT N DEG MIN	LON W DEG MIN	DEPTH KM	N RD S	N SEC	RMS KM	ERH KM	ERZ KM	LOC REMKs	PREF	N	AZ RD	MIN GAP DS
96	JAN	8	40	7.25	18 57.06	155 34.63	41.88	5211	.09	.8	1.0	DLSF	3.5X	6	240	10	
96	JAN	9	1422	47.81	17 2.38	153 53.16	31.34	43 3	.13	3.2	2.7	DIS	3.3X	4	343282		
96	JAN	20	2300	22.73	19 20.91	155 7.76	8.60	5718	.14	.3	.3	SF4F	3.2X	4	120	4	
96	JAN	21	1109	1.74	19 50.83	155 31.37	20.71	5518	.10	.6	1.3	KEAF	4.4D	1	193	10	
96	JAN	21	1558	46.87	19 50.27	155 31.66	16.43	5719	.11	.6	2.3	KEAF	3.1X	4	189	10	
96	JAN	30	1839	41.21	19 21.74	155 2.86	4.09	10 2	.15	6.114	4.4	SSFE-	3.3D	1	299	9	
96	MAR	2	2228	53.42	19 21.45	155 6.83	10.48	5115	.11	.5	.3	SF4F	3.2X	2	174	4	
96	MAR	5	107	53.71	19 28.62	155 15.92	24.93	5717	.12	.5	.6	DEPF	4.0D	1	54	2	
96	MAR	8	2015	20.91	19 49.36	155 33.70	28.08	5917	.10	.5	1.0	KEAF	3.5X	4	104	11	
96	MAR	14	659	33.94	20 23.86	156 24.07	33.46	5512	.15	.9	1.7	DIS	3.2X	5	148	38	
96	MAR	17	918	14.95	19 49.59	156 8.91	40.20	5311	.11	.9	1.3	HUAF	3.2X	8	291	36	
96	MAR	31	721	26.34	17 31.28	154 43.88	6.92	24 4	.13	10.312	6.4	DIS -	3.0X	2	341189		
96	APR	4	2227	20.70	19 37.95	155 49.10	15.14	46 8	.12	.6	.4	KONF	3.1X	6	127	6	
96	APR	10	1208	35.01	20 11.88	157 48.11	2.14	37 5	.12	13.6	7.4	DIS -	3.2X	6	339212		
96	APR	16	1855	24.30	19 45.46	155 26.86	25.65	4912	.09	.5	.9	KEA	3.1X	8	78	3	
96	MAY	17	127	1.16	20 9.95	155 57.40	29.27	5314	.11	.8	2.7	KOH	3.1X	7	299	54	
96	JUN	9	1238	37.57	18 47.11	155 13.80	10.52	33 2	.09	2.0	1.1	LOI	3.0X	3	302	48	
96	JUN	14	11	23.42	18 55.79	155 9.68	49.57	5711	.11	.9	1.4	LOIF	4.8D	1	249	40	
96	JUN	29	1232	5.26	19 15.77	155 13.79	34.33	5110	.10	.7	.9	DEPF	4.4D	1	162	2	
96	JUL	16	2350	9.59	18 49.75	155 17.30	13.24	46 9	.12	1.5	2.7	LOI	3.1X	4	273	41	
96	JUL	17	39	13.97	18 47.65	155 16.50	11.16	42 5	.12	1.0	1.2	LOI	3.0X	3	278	45	
96	JUL	17	105	29.89	18 51.58	155 13.52	12.86	43 6	.12	1.4	2.0	LOI	3.0X	3	270	42	
96	JUL	17	653	32.09	18 53.21	155 13.47	13.11	46 8	.12	1.0	1.8	LOI	3.8X	1	253	39	
96	JUL	18	739	52.24	19 53.44	155 35.03	14.21	51 8	.10	.9	.6	KEAF	4.4D	1	220	18	
96	JUL	18	2014	59.13	18 47.35	155 12.51	9.31	40 8	.12	1.0	1.2	LOI	3.1X	3	297	49	
96	JUL	21	723	58.62	18 57.53	155 13.52	13.21	30 1	.12	1.7	.8	LOI	3.1X	1	241	33	
96	JUL	21	726	18.07	18 54.73	155 16.61	14.29	39	.11	2.1	1.6	LOI	3.2X	1	245	34	
96	JUL	21	1219	36.43	18 50.78	155 11.32	10.96	33 3	.11	1.3	.7	LOI	3.4D	1	294	45	
96	JUL	21	1301	9.22	18 54.32	155 16.45	13.84	40	.09	1.5	1.4	LOI	3.0X	3	247	34	
96	JUL	21	1804	49.36	18 53.30	155 16.54	13.34	40 4	.11	1.1	.9	LOI	4.2D	1	265	36	
96	JUL	21	1805	17.67	18 54.76	155 16.81	13.93	39 2	.09	1.2	1.1	LOI	3.0X	1	245	33	
96	JUL	21	1909	36.02	18 53.86	155 16.09	13.84	38 1	.12	2.0	1.9	LOI	3.0X	2	248	35	
96	JUL	21	2045	45.32	18 55.13	155 17.10	14.74	39	.10	1.8	2.2	LOI	3.1X	1	245	33	
96	JUL	21	2141	33.21	18 53.91	155 16.34	11.33	35 1	.12	1.9	.8	LOI	3.3X	1	264	35	
96	JUL	21	2223	41.84	18 53.39	155 15.40	13.23	34	.09	2.9	1.3	LOI	3.0X	2	268	37	
96	JUL	21	2247	2.03	18 54.78	155 16.08	14.26	36	.09	1.7	2.4	LOI	3.0X	2	246	34	
96	JUL	21	2319	20.20	18 54.41	155 16.51	14.19	38	.09	1.6	2.4	LOI	3.1X	3	248	34	
96	JUL	22	7	8.84	18 50.97	155 14.03	11.62	29 6	.10	1.3	1.4	LOI	3.0X	3	306	42	
96	JUL	22	13	56.31	18 54.07	155 16.19	13.48	37	.10	2.3	1.1	LOI	3.0X	2	249	35	
96	JUL	22	56	59.55	18 51.69	155 16.01	12.52	30 3	.11	1.4	1.1	LOI	3.0X	4	270	39	

ORIGIN TIME	LAT N	LON W	DEPTH	N	N	RMS	ERH	ERZ	LOC	PREF	N	AZ	MIN							
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMKs	MAG	RD	GAP	DS	
96	JUL	22	116	53.48	18	52.54	155	15.91	10.28	42	5	.13	1.3	.8	LOI	4.1D	1	268	38	
96	JUL	22	205	19.81	18	55.95	155	16.37	14.62	26		.10	2.2	1.8	LOI	3.1X	2	243	32	
96	JUL	22	231	23.53	18	53.84	155	16.75	10.29	39	3	.11	1.4	1.0	LOI	3.2X	2	265	45	
96	JUL	22	409	49.29	18	53.83	155	15.79	12.82	41	2	.11	2.0	1.3	LOI	4.0D	1	250	36	
96	JUL	22	450	59.23	18	56.45	155	16.28	14.59	38		.11	1.4	1.7	LOI	4.1D	1	240	32	
96	JUL	22	517	37.41	18	55.53	155	16.62	14.08	22		.08	3.0	1.6	LOI	4.2D	1	259	32	
96	JUL	22	646	56.44	18	54.59	155	16.13	14.44	39		.10	2.2	4.5	LOI	4.2D	1	246	34	
96	JUL	22	725	23.75	18	57.85	155	16.48	15.18	28	1	.09	1.6	2.6	LOI	3.0X	2	235	29	
96	JUL	22	728	20.50	18	48.74	155	13.66	10.19	38	4	.11	1.4	1.1	LOI	4.0D	1	294	46	
96	JUL	22	804	0.97	18	51.85	155	14.90	12.15	38	2	.09	1.8	1.3	LOI	3.3X	1	260	40	
96	JUL	22	859	19.02	18	55.83	155	17.27	15.63	23		.08	2.7	13.1	LOI	-	3.0X	2	257	31
96	JUL	22	910	7.46	18	48.68	155	14.15	9.37	45	7	.14	1.3	.9	LOI	4.4D	1	281	45	
96	JUL	22	1021	17.22	18	54.21	155	16.35	14.23	34		.10	1.9	2.9	LOI	3.0X	2	254	35	
96	JUL	22	1033	28.34	18	54.93	155	15.82	14.18	39	1	.10	1.6	2.1	LOI	3.1X	2	246	34	
96	JUL	22	1107	28.33	18	55.79	155	16.23	13.93	36		.13	1.8	1.1	LOI	4.2D	1	242	33	
96	JUL	22	1131	52.89	18	49.84	155	17.19	21.89	46	9	.14	1.1	6.1	LOI	4.7D	1	273	41	
96	JUL	22	1235	37.83	18	56.69	155	16.16	14.44	41	2	.10	1.3	1.1	LOI	3.1X	2	239	31	
96	JUL	22	1236	43.03	18	56.09	155	16.33	17.12	34		.10	1.8	12.7	LOI	-	4.2D	1	241	32
96	JUL	22	1311	39.49	18	55.89	155	15.70	13.84	36		.11	2.6	1.4	LOI	3.2X	1	244	33	
96	JUL	22	1410	46.14	18	55.47	155	16.76	12.52	38		.12	1.7	1.0	LOI	4.0D	1	242	32	
96	JUL	22	1442	7.12	18	53.68	155	15.84	13.75	26	3	.10	1.5	1.4	LOI	3.0X	3	266	36	
96	JUL	22	1449	0.45	18	55.71	155	16.62	19.58	26		.09	2.2	6.5	LOI	4.3D	1	242	32	
96	JUL	22	1639	18.46	18	56.17	155	15.69	33.21	37		.14	1.9	3.0	LOI	3.0X	3	242	33	
96	JUL	22	1646	10.38	18	56.86	155	16.04	14.52	38		.11	1.2	1.3	LOI	3.0X	1	239	31	
96	JUL	22	1712	29.81	18	55.00	155	16.39	14.03	40		.10	1.9	1.3	LOIF	4.5D	1	244	33	
96	JUL	22	1734	47.06	18	55.40	155	16.07	14.27	39		.12	1.6	1.9	LOI	4.3D	1	243	33	
96	JUL	22	1739	39.98	18	51.00	155	15.37	10.37	42	4	.12	1.4	.9	LOI	4.0D	1	272	41	
96	JUL	22	1812	24.56	18	54.71	155	15.94	12.34	38		.12	2.1	.9	LOI	3.8D	1	247	34	
96	JUL	22	1855	56.46	18	54.43	155	16.33	13.92	40		.11	1.7	1.8	LOI	3.9D	1	248	34	
96	JUL	22	1909	7.24	18	55.36	155	15.87	12.63	36	2	.13	1.5	.9	LOI	3.0X	2	243	34	
96	JUL	22	1913	53.67	18	54.60	155	16.15	14.31	41		.11	2.0	3.5	LOI	4.1D	1	246	34	
96	JUL	22	1939	20.56	18	51.25	155	15.18	14.83	36	1	.11	3.0	4.4	LOI	3.0X	2	262	40	
96	JUL	22	2104	6.71	18	53.63	155	14.95	12.03	41	2	.11	1.5	1.0	LOI	3.0X	1	265	37	
96	JUL	22	2250	8.65	18	55.50	155	16.63	14.67	40		.10	1.7	2.0	LOI	4.2D	1	242	32	
96	JUL	22	2339	14.47	18	53.86	155	15.00	13.11	30		.08	4.4	1.5	LOI	3.0X	1	287	37	
96	JUL	22	2341	37.74	18	54.12	155	15.89	13.84	41	3	.11	1.2	1.5	LOI	4.3D	1	247	35	
96	JUL	22	2343	50.14	18	58.32	155	19.92	27.83	33	1	.14	1.6	2.0	LOI	3.0X	1	231	25	
96	JUL	23	46	48.19	18	55.45	155	16.60	14.38	39		.10	2.0	1.4	LOI	4.2D	1	244	33	
96	JUL	23	59	45.38	18	54.85	155	16.74	11.24	24		.11	3.8	.8	LOI	3.2X	1	278	33	
96	JUL	23	115	32.11	18	53.07	155	15.25	10.07	40	2	.11	1.5	.7	LOI	4.1D	1	267	38	
96	JUL	23	132	3.64	18	54.44	155	16.27	14.41	28	3	.08	1.6	2.9	LOI	4.1D	1	263	34	
96	JUL	23	136	14.53	18	55.67	155	16.17	15.45	26		.07	2.5	13.8	LOI	-	3.0X	1	243	33
96	JUL	23	257	32.18	18	48.89	155	14.25	9.42	37	1	.12	2.2	1.2	LOI	4.2D	1	294	45	
96	JUL	23	259	52.47	18	55.24	155	16.35	14.93	38		.10	1.9	4.0	LOI	4.2D	1	244	33	
96	JUL	23	320	21.22	18	55.24	155	15.07	12.64	23	2	.10	1.8	.9	LOI	3.1X	2	263	35	

ORIGIN TIME				LAT N	LON W	DEPTH	N	N	RMS	ERH	ERZ	LOC	PREF	N	AZ	MIN		
YR	MON	DA	HRMN	SEC	DEG MIN	DEG MIN	KM	RD	S	SEC	KM	KM	REMKS	MAG	RD	GAP	DS	
96	JUL	23	324	58.49	18 49.29	155 13.91	10.17	33	1	.10	2.2	.9	LOI	4.9D	1	293	45	
96	JUL	23	330	41.78	18 53.93	155 15.52	13.82	31		.12	2.7	2.1	LOI	3.0X	2	250	36	
96	JUL	23	1030	45.32	18 55.58	155 16.27	12.55	40		.12	2.0	.9	LOI	3.9D	1	243	33	
96	JUL	23	1111	12.92	18 55.09	155 16.38	13.92	35		.11	2.8	1.2	LOI	3.4X	1	251	33	
96	JUL	23	1207	1.72	18 49.20	155 14.19	11.60	24	5	.10	1.7	1.6	LOI	3.1X	2	298	44	
96	JUL	23	1211	44.53	18 52.66	155 16.12	13.17	37	4	.11	1.5	1.2	LOI	3.3X	1	275	37	
96	JUL	23	1245	54.20	18 54.33	155 16.54	16.26	37		.11	1.9	15.2	LOI	-	4.0D	1	247	34
96	JUL	23	1347	31.86	18 53.14	155 15.82	20.44	43	4	.11	1.2	5.7	LOI	4.0D	1	266	37	
96	JUL	23	1419	48.89	18 52.47	155 12.67	8.41	17	5	.13	1.4	1.3	LOI	4.0D	1	285	41	
96	JUL	23	1431	17.37	18 56.38	155 16.69	14.37	31		.10	2.8	1.2	LOI	3.0X	2	247	31	
96	JUL	23	1437	15.39	18 55.80	155 17.17	15.16	36		.10	2.2	3.7	LOI	3.3X	1	243	31	
96	JUL	23	1518	43.48	18 56.47	155 16.52	17.23	36		.12	2.0	12.5	LOI	-	3.5X	1	240	31
96	JUL	23	1639	4.46	18 54.74	155 16.57	14.51	35		.11	1.8	2.3	LOI	3.1X	1	247	34	
96	JUL	23	1657	39.39	18 55.12	155 16.11	13.87	39		.11	1.9	1.4	LOI	3.9D	1	244	34	
96	JUL	23	1759	4.92	18 58.32	155 16.76	14.05	25	2	.13	2.0	1.1	LOI	3.1X	1	272	28	
96	JUL	23	1904	11.38	18 54.75	155 17.00	12.26	39		.11	2.5	.8	LOI	3.2X	2	262	33	
96	JUL	23	1948	38.01	18 55.20	155 15.94	14.03	25	2	.09	1.2	1.5	LOI	4.1D	1	244	34	
96	JUL	23	2009	49.62	18 53.78	155 15.40	11.58	18	3	.14	2.0	1.1	LOI	3.0X	1	282	36	
96	JUL	23	2012	23.50	18 54.89	155 15.72	10.51	29	2	.11	1.7	.7	LOI	4.3D	1	246	34	
96	JUL	23	2127	18.83	18 54.54	155 15.90	16.30	23		.11	3.4	15.6	LOI	-	3.4X	2	263	35
96	JUL	23	2251	53.72	18 53.55	155 15.66	13.54	36	1	.09	1.9	1.5	LOI	4.1D	1	266	36	
96	JUL	23	2304	33.08	18 58.27	155 15.59	12.13	20	1	.14	2.1	.9	LOI	3.1X	1	252	30	
96	JUL	24	5	8.18	18 52.48	155 16.12	10.58	30	1	.13	2.2	.8	LOI	3.2X	1	287	38	
96	JUL	24	54	5.61	18 53.06	155 16.04	10.72	39		.10	2.6	.9	LOI	4.6D	1	251	37	
96	JUL	24	351	2.74	18 52.39	155 15.09	13.05	32	1	.09	2.4	2.0	LOI	4.2D	1	271	39	
96	JUL	24	452	38.46	18 54.38	155 16.45	14.34	36		.09	1.9	3.2	LOI	3.3X	1	248	34	
96	JUL	24	549	42.63	18 31.71	155 13.70	48.93	19	1	.11	8.8	5.7	DIS	3.2X	1	312	68	
96	JUL	24	652	49.24	18 53.32	155 16.19	13.61	38	2	.11	1.5	1.2	LOI	4.1D	1	250	36	
96	JUL	24	659	5.91	18 51.72	155 15.12	12.41	23	2	.08	1.9	1.2	LOI	3.0X	2	287	40	
96	JUL	24	738	50.52	18 55.36	155 16.72	14.53	38		.10	1.5	1.6	LOI	4.9D	1	243	33	
96	JUL	24	1127	7.32	18 59.00	155 17.61	11.42	20	4	.10	1.6	.8	LOI	3.3X	1	244	34	
96	JUL	24	1312	13.86	18 54.33	155 15.94	13.97	33	1	.09	1.9	1.6	LOI	3.3X	1	248	35	
96	JUL	24	1416	2.50	18 48.52	155 13.69	4.84	28		.12	5.6	2.8	LOI	3.0D	1	297	46	
96	JUL	24	1546	55.48	18 54.09	155 16.71	11.49	26	2	.09	1.6	.8	LOI	3.1X	2	283	43	
96	JUL	24	1645	22.44	18 56.08	155 17.46	15.38	27		.10	2.4	6.9	LOI	4.2D	1	242	31	
96	JUL	24	1658	9.41	18 55.37	155 17.41	16.07	22		.08	2.0	14.3	LOI	-	4.0D	1	243	32
96	JUL	24	1813	48.01	18 54.87	155 15.80	15.38	25	4	.10	4.2	7.7	LOI	4.0D	1	285	34	
96	JUL	25	703	23.31	18 53.79	155 16.27	13.94	27		.09	3.7	1.7	LOI	3.0X	1	271	35	
96	JUL	25	1416	18.04	18 55.16	155 16.68	14.63	34		.10	2.4	2.0	LOI	3.3X	1	245	33	
96	JUL	26	219	38.84	18 53.74	155 16.24	13.71	36		.10	2.8	1.7	LOI	3.8D	1	266	36	
96	JUL	26	324	49.29	18 55.90	155 16.88	16.08	26		.08	1.9	14.0	LOI	-	4.4D	1	241	32
96	JUL	26	544	2.27	18 55.15	155 16.83	15.07	39		.11	2.0	4.8	LOI	3.9D	1	244	33	
96	JUL	26	625	45.17	18 54.97	155 16.30	14.79	38		.11	2.0	3.8	LOI	3.6X	1	245	34	
96	JUL	26	1202	32.38	18 54.59	155 16.19	14.08	39	1	.10	1.8	1.8	LOI	4.1D	1	247	34	
96	JUL	26	1359	47.80	18 56.55	155 16.55	14.91	27	3	.09	1.2	2.0	LOI	3.3X	1	240	31	

YR	MON	DA	HRMN	SEC	LAT N DEG MIN	LON W DEG MIN	DEPTH KM	N RD S	N SEC	RMS KM	ERH KM	ERZ KM	LOC REMKS	PREF MAG	N RD	AZ GAP	MIN DS
96	JUL	26	1559	45.84	18 45.04	155 13.71	9.75	24	1	.07	5.7	2.6	LOI	3.0X	1	291	52
96	JUL	26	1733	23.87	18 54.17	155 16.15	13.81	35		.11	2.2	1.5	LOI	3.8D	1	248	35
96	JUL	26	1805	41.32	18 52.20	155 17.16	9.45	27	6	.13	1.3	.8	LOI	4.3D	1	287	43
96	JUL	26	1827	38.30	18 56.14	155 16.72	16.24	25		.09	2.014	4.3	LOI	- 4.0D	1	241	31
96	JUL	26	1853	46.18	18 55.78	155 16.29	14.37	26		.13	2.5	1.3	LOI	3.5D	1	243	32
96	JUL	26	1950	29.77	18 52.49	155 15.83	9.92	31	8	.11	1.0	.7	LOI	3.4X	2	268	38
96	JUL	26	2205	39.17	18 54.47	155 16.46	14.25	36		.10	1.6	2.4	LOI	4.3D	1	247	34
96	JUL	26	2324	24.35	18 49.93	155 15.52	15.00	28		.17	4.218	9	LOI	- 3.1X	1	274	42
96	JUL	27	9	27.29	18 55.43	155 16.29	14.47	38		.11	1.7	2.3	LOI	4.1D	1	243	33
96	JUL	27	15	2.16	18 54.61	155 15.96	12.96	23	2	.09	1.8	1.0	LOI	3.0X	3	251	35
96	JUL	27	25	47.40	18 54.84	155 16.28	14.67	36		.10	1.9	3.5	LOI	4.4D	1	245	34
96	JUL	27	159	6.21	18 54.64	155 16.15	14.01	38		.11	1.7	1.8	LOI	3.2X	1	246	34
96	JUL	27	203	25.80	18 51.83	155 16.15	15.69	24	7	.10	4.110	0	LOI	- 3.4X	1	291	39
96	JUL	27	217	45.90	18 56.46	155 17.31	14.72	38		.13	1.6	1.2	LOI	4.0D	1	239	30
96	JUL	27	1029	48.24	18 57.69	155 16.51	14.72	25	1	.10	1.4	1.3	LOI	3.3X	1	236	30
96	JUL	27	1033	3.31	18 54.09	155 16.35	9.87	21	4	.11	1.5	.6	LOI	3.0X	3	265	35
96	JUL	27	1202	13.82	18 55.15	155 16.61	14.42	38		.10	1.6	2.2	LOI	4.6D	1	244	33
96	JUL	27	1210	6.79	18 54.77	155 16.13	14.50	35		.11	2.3	4.6	LOI	4.4D	1	246	34
96	JUL	27	1218	26.90	18 53.65	155 16.07	13.47	39	2	.12	1.7	1.4	LOI	4.1D	1	250	36
96	JUL	27	1359	12.07	18 55.16	155 16.07	13.77	36		.11	1.8	1.2	LOI	3.8D	1	244	34
96	JUL	27	1510	38.71	18 55.83	155 16.30	14.93	41	1	.09	1.5	2.6	LOI	3.3X	1	242	32
96	JUL	27	1513	1.90	18 45.83	155 12.55	20.80	27	4	.12	1.7	9.8	LOI	3.3X	2	282	51
96	JUL	27	1525	51.33	18 53.38	155 15.26	11.54	31		.11	2.8	.6	LOI	3.3X	2	252	37
96	JUL	27	1544	28.02	18 54.61	155 16.42	13.77	28		.10	2.8	1.3	LOI	4.2D	1	247	34
96	JUL	27	1546	22.56	18 52.90	155 15.55	13.64	30	1	.11	1.7	1.3	LOI	4.4D	1	268	37
96	JUL	27	1615	10.00	18 48.85	155 13.78	10.16	36	4	.11	1.4	1.2	LOI	3.3X	1	294	45
96	JUL	27	1702	55.35	18 42.59	155 12.60	7.27	34	6	.11	1.1	1.4	LOI	4.7D	1	296	56
96	JUL	27	1821	32.59	18 57.50	155 18.35	16.73	19		.10	1.713	8	LOI	- 3.0X	2	235	28
96	JUL	27	1839	4.62	18 57.04	155 16.30	14.34	22	1	.08	1.4	1.1	LOI	3.3X	1	237	31
96	JUL	27	1851	49.18	18 54.74	155 16.06	14.17	38		.11	1.8	2.6	LOI	4.3D	1	246	34
96	JUL	27	1931	33.14	18 53.88	155 15.67	9.76	28		.20	2.8	1.0	LOI	3.1X	1	250	36
96	JUL	27	1937	6.70	18 54.70	155 16.49	10.79	38		.09	2.3	.8	LOI	3.8D	1	262	34
96	JUL	27	2003	56.11	18 52.57	155 15.30	12.03	21		.07	2.9	1.2	LOI	3.5D	1	271	38
96	JUL	27	2142	2.40	18 54.49	155 16.08	13.91	38		.11	1.8	1.5	LOI	4.4D	1	247	35
96	JUL	27	2144	13.77	18 54.75	155 16.01	14.69	32	1	.10	2.3	5.3	LOI	4.4D	1	246	34
96	JUL	27	2254	27.65	18 51.37	155 15.18	9.68	26	2	.10	1.6	1.0	LOI	3.1X	2	271	40
96	JUL	27	2316	58.55	18 56.00	155 16.60	16.01	22		.09	2.014	5	LOI	- 3.3X	1	241	32
96	JUL	27	2330	21.32	18 53.19	155 15.46	7.09	5115		.14	.8	.7	LOIF	4.9D	1	251	37
96	JUL	27	2338	42.15	18 54.69	155 16.13	14.37	38	1	.10	1.5	2.7	LOI	3.2X	1	247	34
96	JUL	28	52	11.64	18 55.22	155 16.87	15.55	34		.11	2.314	7	LOI	- 3.0X	2	245	33
96	JUL	28	251	24.48	18 52.52	155 16.21	13.19	35	1	.12	2.1	1.6	LOI	3.1X	2	253	37
96	JUL	28	502	17.59	18 53.40	155 16.05	13.52	34		.10	2.4	1.4	LOI	3.5D	1	251	36
96	JUL	28	519	57.43	18 52.79	155 15.39	12.67	38	2	.10	1.7	1.4	LOI	3.2X	2	268	38
96	JUL	28	538	57.43	18 54.96	155 17.02	12.71	36		.10	1.9	.9	LOI	3.0X	3	246	33
96	JUL	28	731	35.53	18 50.41	155 14.93	10.69	29		.10	3.6	1.1	LOI	3.1D	1	277	42

ORIGIN TIME	LAT N	LON W	DEPTH	N	N	RMS	ERH	ERZ	LOC	PREF	N	AZ	MIN							
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMKS	MAG	RD	GAP	DS	
96	JUL	28	807	19.49	18	53.82	155	16.27	10.83	36		.12	2.4	.8	LOI	3.1X	2	250	35	
96	JUL	28	812	12.23	18	46.51	155	13.34	9.75	39	7	.11	1.3	1.5	LOI	4.4D	1	298	49	
96	JUL	28	826	6.62	18	53.81	155	16.28	14.23	35	2	.10	1.7	3.0	LOI	3.0X	2	266	35	
96	JUL	28	915	49.45	18	54.28	155	16.13	13.85	27	4	.08	1.1	1.3	LOI	3.2X	4	252	35	
96	JUL	28	917	31.72	18	46.91	155	14.56	7.33	36	2	.13	1.7	.8	LOI	3.1X	3	280	48	
96	JUL	28	1009	10.46	18	54.57	155	15.75	13.84	35		.12	1.9	1.4	LOI	3.1X	1	247	35	
96	JUL	28	1106	49.53	18	55.04	155	14.94	7.98	29	1	.14	3.8	1.3	LOI	3.1X	3	253	35	
96	JUL	28	1112	46.94	18	53.85	155	14.38	10.17	34	2	.12	1.3	.6	LOI	3.3X	1	250	37	
96	JUL	28	1204	42.57	18	53.48	155	15.34	11.53	32		.14	2.8	.8	LOI	4.1D	1	258	37	
96	JUL	28	1209	27.45	18	52.49	155	15.90	13.37	23	4	.09	1.2	1.5	LOI	4.4D	1	269	38	
96	JUL	28	1244	47.09	18	56.63	155	15.72	11.23	22	5	.12	1.0	.6	LOI	4.1D	1	241	32	
96	JUL	28	1253	33.48	18	54.79	155	16.86	14.97	35		.10	2.1	4.3	LOI	3.2X	1	246	33	
96	JUL	28	1334	3.71	18	54.42	155	15.85	13.79	39		.10	2.1	1.5	LOI	3.9D	1	248	35	
96	JUL	28	1339	51.11	18	51.64	155	14.67	13.19	21	8	.09	1.3	1.5	LOI	3.0X	2	274	40	
96	JUL	28	1435	13.45	18	50.65	155	15.71	12.90	37	6	.11	1.2	1.8	LOI	3.1X	1	272	41	
96	JUL	28	1515	24.66	19	21.31	155	20.51	32.58	39	2	.11	.6	1.1	DEP	3.0D	1	55	5	
96	JUL	28	1613	23.56	18	56.28	155	16.79	14.72	22		.09	2.3	1.8	LOI	3.0X	2	241	31	
96	JUL	28	1709	24.17	18	55.87	155	17.43	15.15	16	1	.10	2.0	3.6	LOI	3.2X	2	243	31	
96	JUL	28	1718	21.98	18	43.68	155	12.28	8.04	31	4	.11	1.0	1.6	LOI	3.3X	2	295	55	
96	JUL	28	1719	59.63	18	54.11	155	15.83	14.14	35		.09	1.9	2.9	LOI	4.4D	1	249	35	
96	JUL	28	1734	10.16	18	56.53	155	17.24	14.40	33		.10	1.8	1.1	LOI	4.0D	1	240	30	
96	JUL	28	1736	42.68	18	44.90	155	12.31	30.03	28	5	.13	2.1	4.6	LOI	3.0X	3	292	53	
96	JUL	28	1800	43.87	18	37.40	155	11.82	29.08	20	5	.10	2.2	7.3	DIS	3.1X	2	304	63	
96	JUL	28	1849	40.93	18	53.62	155	15.90	13.33	35		.10	2.5	1.5	LOI	4.0D	1	251	36	
96	JUL	28	2008	4.89	18	55.62	155	15.78	14.06	28		.10	1.6	1.5	LOI	3.3X	1	245	33	
96	JUL	28	2032	21.99	18	49.31	155	14.96	13.92	26	3	.10	4.7	7.0	LOI	3.1X	2	279	44	
96	JUL	28	2055	56.24	18	55.03	155	16.77	14.59	37	1	.09	1.4	2.0	LOI	3.1X	2	246	33	
96	JUL	28	2121	32.88	18	53.65	155	15.91	13.71	26		.08	2.4	1.2	LOI	3.7D	1	266	36	
96	JUL	28	2124	4.80	18	58.48	155	17.36	10.14	29		.15	1.5	.8	LOI	3.8D	1	234	27	
96	JUL	28	2220	53.82	18	54.96	155	14.96	11.94	31		.11	1.7	.7	LOI	3.9D	1	247	35	
96	JUL	28	2231	4.51	18	54.29	155	16.00	15.39	38		.09	2.2	14.4	LOI	-	4.4D	1	248	35
96	JUL	28	2303	30.12	18	55.21	155	14.94	9.56	26		.14	1.7	.7	LOI	3.9D	1	246	35	
96	JUL	29	100	33.26	18	55.62	155	16.67	16.59	12		.09	2.3	14.5	LOI	-	4.6D	1	244	32
96	JUL	29	113	7.56	18	54.55	155	15.93	12.01	22	5	.12	1.6	.9	LOI	3.1X	3	263	35	
96	JUL	29	222	38.14	18	55.50	155	15.18	12.21	25		.10	4.1	.9	LOI	3.7D	1	271	34	
96	JUL	29	346	47.07	18	54.61	155	15.86	13.51	37		.10	2.2	1.2	LOI	4.3D	1	247	35	
96	JUL	29	428	35.55	18	52.24	155	15.34	11.75	35	1	.11	1.9	1.1	LOI	4.1D	1	270	39	
96	JUL	29	631	1.43	18	54.07	155	15.82	13.85	30	5	.11	.9	1.2	LOI	3.1X	2	252	35	
96	JUL	29	817	1.44	18	50.73	155	15.38	10.37	21	4	.09	1.9	1.1	LOI	3.3X	2	306	41	
96	JUL	29	825	8.36	18	53.26	155	16.15	13.52	33	4	.11	1.2	.9	LOI	3.2X	2	283	36	
96	JUL	29	826	7.90	18	55.87	155	15.68	7.57	32		.13	2.3	.9	LOI	4.1D	1	260	33	
96	JUL	29	832	22.68	18	52.74	155	15.97	10.34	22	4	.08	1.3	.6	LOI	3.0X	3	286	42	
96	JUL	29	1012	31.78	18	51.85	155	15.06	12.12	21	4	.08	1.5	1.1	LOI	3.1X	2	287	40	
96	JUL	29	1131	6.01	18	49.46	155	14.45	11.38	25	3	.09	1.3	.9	LOI	3.2X	2	280	44	
96	JUL	29	1315	4.33	18	54.05	155	15.93	12.59	4610		.10	.9	.7	LOI	3.4X	3	266	35	

ORIGIN TIME	LAT N	LON W	DEPTH	N	N	RMS	ERH	ERZ	LOC	PREF	N	AZ	MIN						
YR	MON	DA	HRMN	SEC	DEG	MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMKs	MAG	RD	GAP	DS
96	JUL	29	1559	17.51	18	55.35	155	15.37	10.91	22	5	.13	1.3	.8	LOI	3.1X	2	245	34
96	JUL	29	1614	38.29	18	51.79	155	15.88	9.90	23	4	.10	1.5	.9	LOI	3.3X	1	274	39
96	JUL	29	1745	22.59	18	52.59	155	15.49	13.25	25	4	.08	1.3	1.7	LOI	3.3X	3	254	38
96	JUL	29	2038	7.40	18	52.95	155	15.51	13.31	36	3	.09	1.2	1.1	LOI	4.4D	1	271	37
96	JUL	29	2105	24.62	18	54.77	155	15.34	13.37	24	2	.10	1.8	1.1	LOI	3.1X	2	248	35
96	JUL	30	46	36.40	18	54.29	155	15.95	15.43	29	3	.10	2.3	5.1	LOI	3.0X	1	252	35
96	JUL	30	329	54.32	18	53.69	155	15.82	13.74	36		.10	2.5	1.8	LOI	3.4X	1	250	36
96	JUL	30	355	45.05	18	53.19	155	16.28	11.57	41	6	.11	1.3	.8	LOI	4.7D	1	267	36
96	JUL	30	1159	32.28	18	45.99	155	13.25	10.55	30	2	.09	1.9	4.0	LOI	3.3X	2	289	50
96	JUL	30	1406	28.00	18	54.16	155	15.82	13.57	42	6	.09	.8	1.0	LOI	3.2X	2	249	35
96	JUL	30	1938	55.59	18	53.98	155	16.51	13.66	29	6	.10	.9	.8	LOI	3.1X	3	249	35
96	JUL	30	1944	31.02	18	53.23	155	15.23	12.28	28	8	.12	.9	.7	LOI	3.2X	4	252	37
96	JUL	31	556	33.36	18	51.85	155	14.80	12.14	24	5	.10	1.5	1.0	LOI	3.1X	3	273	40
96	JUL	31	650	2.26	18	55.76	155	15.67	13.64	26	5	.09	1.0	.9	LOI	3.1X	3	244	33
96	JUL	31	656	17.11	18	53.32	155	16.14	10.30	24	4	.08	1.2	.8	LOI	3.4X	1	267	41
96	JUL	31	1459	31.14	18	55.47	155	16.64	13.58	37	5	.12	1.4	1.0	LOI	3.0X	4	259	33
96	JUL	31	2128	42.96	18	53.96	155	15.84	14.38	24	4	.06	1.8	3.2	LOI	3.2X	2	266	36
96	AUG	1	214	27.17	18	53.95	155	16.20	13.93	29	7	.09	.9	1.2	LOI	3.3X	3	249	35
96	AUG	1	215	48.84	18	53.94	155	16.39	10.78	24	6	.10	1.3	.7	LOI	4.3D	1	265	40
96	AUG	1	1623	32.63	18	51.48	155	16.21	10.16	41	5	.12	1.4	.9	LOI	3.2X	3	271	39
96	AUG	1	1801	38.82	18	53.85	155	16.32	11.32	27	5	.09	1.3	.7	LOI	3.0X	4	265	35
96	AUG	2	1001	40.23	18	51.73	155	15.73	10.05	28	6	.11	1.3	.8	LOI	4.4D	1	271	39
96	AUG	2	1009	11.38	18	52.32	155	15.46	12.53	22	4	.08	1.0	1.4	LOI	3.1X	3	286	38
96	AUG	2	2304	20.72	18	53.35	155	15.65	13.96	33	8	.10	1.0	1.7	LOI	3.1X	4	251	37
96	AUG	2	2309	7.31	18	53.36	155	15.26	12.49	25	6	.08	1.0	.8	LOI	3.1X	2	255	37
96	AUG	4	24	15.79	18	53.12	155	15.76	13.45	31	6	.11	.9	.7	LOI	3.1X	4	253	37
96	AUG	4	226	14.14	18	52.57	155	15.72	12.42	27	4	.10	.9	.8	LOI	3.0X	5	257	38
96	AUG	4	1427	11.10	18	54.43	155	15.67	13.61	27	5	.09	1.1	.8	LOI	3.2X	3	249	35
96	AUG	5	704	49.98	18	52.48	155	15.03	10.01	23	4	.10	1.4	.6	LOI	3.0X	5	289	39
96	AUG	5	1029	50.32	18	49.94	155	13.35	37.82	43	9	.14	1.2	2.1	LOI	4.8D	1	280	44
96	AUG	5	1954	20.93	18	55.41	155	16.80	14.92	22		.06	1.8	1.8	LOI	3.1X	2	245	32
96	AUG	6	1602	9.84	18	54.95	155	16.11	16.55	36		.10	2.014.9	LOI	-	4.4D	1	246	34
96	AUG	7	537	54.14	20	52.01	155	26.38	16.30	46	8	.13	3.015.8	DIS	-	3.6X	5	318109	
96	AUG	8	23	35.78	18	51.71	155	15.48	12.29	25	6	.07	1.0	.8	LOI	3.1X	4	287	39
96	AUG	8	2224	54.83	19	22.20	155	3.96	4.00	4712	.14	.531.6	SSFF-		3.9D	1	161	10	
96	AUG	8	2236	26.45	19	20.67	155	3.77	8.84	38	5	.12	.7	.4	SF5F	3.0X	5	178	8
96	AUG	9	1921	43.79	18	54.59	155	16.55	14.47	37		.10	1.7	2.6	LOI	3.1X	2	248	34
96	AUG	9	1956	29.12	18	52.92	155	16.00	12.19	41	3	.11	1.5	1.2	LOI	4.7D	1	252	37
96	AUG	12	751	10.69	18	46.07	155	14.04	7.08	44	8	.12	1.2	.7	LOI	4.4D	1	282	50
96	AUG	15	217	10.29	18	50.09	155	14.65	11.38	42	6	.10	.9	.9	LOI	3.0X	2	274	43
96	AUG	19	1546	53.66	18	52.65	155	15.80	13.38	33	4	.09	1.2	1.3	LOI	3.2X	2	269	38
96	AUG	22	1143	52.21	18	51.91	155	15.06	11.94	33	4	.11	1.0	1.0	LOI	3.0X	2	270	39
96	AUG	22	2127	31.40	18	54.56	155	16.40	21.73	38		.09	2.0	4.4	LOI	3.0X	3	248	34
96	AUG	28	746	10.02	18	54.99	155	16.92	14.59	30		.10	2.3	1.7	LOI	3.0X	3	261	33
96	SEP	6	139	33.88	18	53.17	155	15.52	11.92	41	7	.14	.8	.7	LOI	3.2X	2	252	37

ORIGIN TIME				LAT N		LON W		DEPTH	N	N	RMS	ERH	ERZ	LOC	PREF	N	AZ	MIN		
YR	MON	DA	HRMN	SEC	DEG MIN	DEG	MIN	KM	RD	S	SEC	KM	KM	REMKS	MAG	RD	GAP	DS		
96	SEP	6	819	27.63	18	52.91	155	16.06	13.21	35	3	.10	1.5	1.3	LOI	3.2X	2	267	37	
96	SEP	10	802	9.87	19	3.29	155	25.34	56.47	33		.13	2.1	3.7	DLST	3.2X	1	204	12	
96	SEP	11	334	33.44	19	44.75	154	49.80	45.97	5218	.11		.8	1.3	HILF	3.5X	6	256	27	
96	SEP	11	818	55.38	19	12.89	155	16.07	32.75	4911	.10		.7	.9	DEPF	3.3X	2	180	9	
96	SEP	13	2248	20.78	18	51.22	155	15.45	9.88	40	7	.11	1.1	.8	LOI	3.4X	3	271	40	
96	SEP	17	632	41.39	22	4.22	156	33.35	34.32	5118	.11		3.5	2.7	DIS	3.9X	7	342274		
96	SEP	21	414	31.37	18	53.41	155	16.38	16.19	32		.09	2.714.6	-	LOI	-	3.0X	3	251	36
96	OCT	16	2212	20.43	19	16.77	155	28.73	10.77	4612	.12		.3	.6	LSWF	3.0X	6	55	9	
96	OCT	21	1713	45.75	19	22.43	155	19.64	30.04	5116	.12		.5	.6	DML	3.2X	8	71	6	
96	OCT	29	1034	34.98	20	7.91	156	35.73	29.68	5216	.11		1.4	2.7	DISF	3.2X	8	319	93	
96	NOV	17	729	10.90	19	28.99	156	12.85	37.18	4914	.12		.9	1.3	KONF	3.8X	5	294	31	
96	NOV	23	1639	24.34	19	19.90	155	12.34	10.50	4910	.11		.4	.3	SF2F	4.3D	1	111	5	